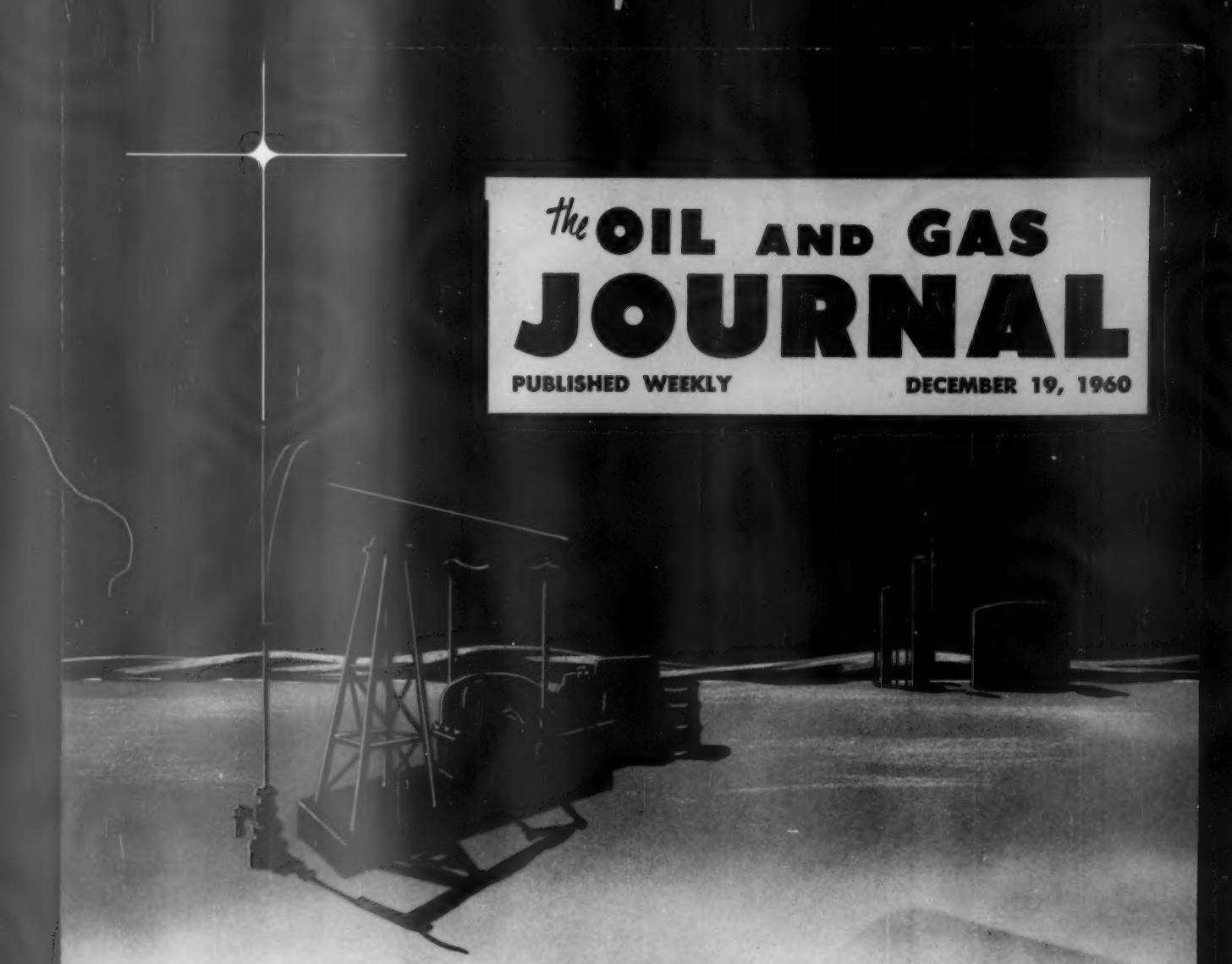
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY DECEMBER 19, 1960



LPG sales jump 10.5% to another new high ▸ 49

Petrochemicals boom in Delaware Valley ▸ 54

New tool permits onstream corrosion checkup ▸ 72

How to save on your oil and gas estate taxes ▸ 82

Top to bottom... Brewster rig relies on Timken® bearings

This N95, 1200 H.P., rotary drilling rig which The Brewster Company recently delivered, is ruggedly designed and built to take the heavy loads imposed by today's deep hole drilling. Timken® tapered roller bearings are used in the crown block, traveling block, swivel, rotary and drawworks of this and other series rigs built by The Brewster Company. The taper lets Timken bearings take *any* combination of radial and thrust loads. Brewster Engineers say that Timken bearings provide the reliability needed for trouble-free service because of their uniformly high quality, precision design and manufacture.

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Industry rolls on

TIMKEN®

tapered roller bearings

OIL AND GAS JOURNAL
Vol. 58, No. 51

Contents December 19, 1960

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TECHNOLOGY—OPERATION

Refining-Processing

New Tool Permits Onstream Corrosion Checkup 72
By Carl J. Lawrence
By applying sonar to refinery inspection, a refiner now can inspect vessels, piping, and other equipment while units are on stream. This leads to better-planned turnarounds—and should result in more throughput, due to less shutdown time.

Peracetic Acid Process Opens New Way To Epoxies 78
By D. H. Stormont
Union Carbide's new 10-million-pound per year plant at Institute, W. Va., represents the first commercial use of peracetic acid to produce epoxies from olefins and other unsaturated materials.

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A new series on principles of combustion.

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Petroleum-Chemical Sales in Japan Up 5,000% in 4 Years 104
By Hugh S. Pylant

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By E. T. Guerrero and F. M. Stewart
How to find initial reservoir pressure from various data.

Oil-Well Pumping—27 90
By Joseph Zaba
How gas can foul up your pump.

Concentric Tubing May Solve High-Pressure Problems 92
By W. D. Smith, Jr.
South Louisiana experience has led to the adoption of a standard way to complete high-pressure gas wells. Where surface shut-in pressure will be 6,000 psi. or more, 1¼-in. tubing is being run inside the 2⅞-in. production string.

Drill-Collar Stabilizers Work in Soft Shales 95
By Robert G. Pearson
Drillers in crooked-hole areas can forget any worries they may have had about whether soft shale formations furnish a good seat for drill-collar stabilizers.

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Why Engine Lubrication Fails—2 109
By O. H. Moore
Calibrating the reservoirs and setting the stroke to match daily makeup will give a more equitable distribution of oil to the lubricating points.

Exploration

Why Explore in California's Sacramento Valley? 74
By Eugene F. Reid
The valley is believed to offer exploration men a big untested area where the average gas well will pay out in 2 years.

General

How to Save on Your Oil and Gas Estate Taxes 82
By Harlan Echols
Many people are not taking advantage of the avenues open for legal reduction of taxes. Every possible opportunity for tax reduction should be explored and used, whether assets are in the form of royalty, production payments, or working interests.

Marketing Research Can Help the Little Fellow 100
By James D. Hughes
This may be an answer to the profit pinch for the smaller firm.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 19, 1960

The LPG industry is enjoying another record year:

Sales will total 9.86-billion gallons for a 10.5% increase over last year, annual survey indicates.

Two trends continue:

...Petrochemical markets again are the fastest growing outlet for LPG.

...Domestic and commercial uses, however, still soak up the greatest volume of product (p. 49)*.

▼ ▼ ▼

Good jobs are open for comptrollers in oil, and it points up a trend: The money experts are coming into their own in petroleum industry.

One medium-sized integrated company has been looking for the right man for months to fill the comptroller's spot. One of the majors also is screening its personnel to spot new talent in the field, and isn't having much luck.

The search is not for accountants or business graduates necessarily but all-around men who can take financial and operating figures and project them into live data for guidance of management.

Along the same line, several companies have added bankers to their directorates in recent months.

▼ ▼ ▼

The labor picture: Tidewater and Shell have joined oil companies offering their employes a 5% general pay increase. It went to nonunion workers automatically and was proposed to unions on a 1-year basis...Bulk of unions still have rejected the 5% offers, mostly because of a 2-year contract to which they are tied. Phillips Chemical now has countered its first 5% offer for 2 years with a 3.5% raise for 1 year...OCAW has won bargaining election at Humble's Baytown plant and will make its wage pitch after first of year.

The maze of state sales and use tax regulations is becoming increasingly annoying to oil-equipment suppliers and

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

the oil firms they supply.

Complaints center on tax audits required by some states which companies say are inefficient, wasteful, and expensive. The tax levies themselves often place an unfair burden on doing business in some states (p. 56).

New breakthrough in data handling now speeds up computer output and reduces its cost. Industry also is a step closer to the computer which will program itself (p. 51).

The forward steps were revealed by Remington Rand, which claimed these advances for Univac: A thin-film computer memory, which steps up machine speed tremendously; and the possibility now of a communications-computer network system.

A White House decision on oil import rule changes is due Wednesday.

Interior was ready to act 2 weeks ago but ran into sharp opposition from other departments, particularly State.

As a result, presidential proclamation is stymied and may be abandoned. If so, import quotas may remain virtually unchanged until after the new administration takes over.

▼ ▼ ▼

North Texas has a depth-record producer at Texas Standard's 1 McAdams, 2 miles west of Pottsboro townsite in central Grayson County. It also is state's second deepest producer.

The McAdams well, an Oil Creek Ordovician discovery, flowed 4,000 M.c.f. daily through perforations at 16,275-16,540 ft. State's deepest producer is Atlantic 1 Kelly in Pecos County, producing at 16,680 ft. in Montoya Ordovician.

Previous North Texas depth record was in the same area at State 2-3 McAdams, completed in 1959 at 12,884 ft.

Three strategic wells may link Midale and Weyburn fields in southeastern Saskatchewan. If so, it would form the province's largest oil field.

Wells are Sun's 1-1 Tangen and 7-1 Tangen and Shell's 1-2 Midale. The Shell well is already a producer; and if the Sun wells also are completed as Mississippian producers, they would join the two fields.

▼ ▼ ▼

A monopoly in LPG transportation in western Canada is sought by Pembina Pipe Line.

This was made clear in Canadian Senate hearings on the incorporation of Aurora Pipe Line, owned by Hudson's Bay Oil & Gas. Aurora plans to move LPG from southwestern Alberta to the international boundary through a 42-mile line.

Pembina complains the line would be American controlled because Continental Oil is a major owner of Hudson's Bay.

Continental also has picked up opposition to its plans

to build an oil spur line into Central Montana.

Crude Oil Pipeline Co., which recently bought out Powder River Pipeline Co. has asked a federal court to halt work on the project. It claims Continental seeks a monopoly and has made threats against producers and shippers if they fail to use the line. Continental called the charges false (p. 62).

FPC's new area-pricing formula may be threatened by latest ruling of Washington appeals court, which sent two cases back to FPC for rehearing (p. 60).

Court scolded the commission for not reviewing prices in the cases, implying that the agency was not making enough of an effort to hold back the rise of natural-gas prices.

Area pricing was not an issue, but prices in the two cases were in line with ceiling set for that area. Observers now wonder if the courts will accept the area prices at all.

▼ ▼ ▼

A giant petrochemical complex is in the making along the Delaware River near Philadelphia.

A half dozen plants have been started or announced in the last year for the area which is second only to Houston as a refining center. Its future growth is based on such advantages as plentiful raw materials, abundant water, a large labor pool, and proximity to markets (p. 54).

A new look in service stations is given the industry by DX Sunray in southeast Tulsa. It is slanted to customer needs, especially the likes and dislikes of the women.

New wrinkles: Circular design of building, spacious sales room sporting a customer TV lounge, self-sufficient pump islands, a driveway hostess, kitchen-neat wash and lube bays blended into the building (p. 52).

Anchor Petroleum Co., Tulsa, is negotiating with Mobil Oil Co., New York, to sell its marketing outlets for LPG and natural gasoline plus its underground-storage facilities.

▼ ▼ ▼

Industry notes: First truly bold bid to expand the demand for gasoline will be made during 1961 when the industry starts promoting pleasure driving...Louisiana's depth bracket allowable will remain unchanged for first 2 months of year but officials will keep close check on the new acreage factor in allowable formula...Ohio Oil has acquired Ross Oil, biggest gasoline and fuel-oil jobber in the state... Purchase of propane-fueled buses for a major part of its future fleet requirements has been recommended to Chicago Transit Authority by a consulting firm which estimated a 2 to 3-cent per mile saving over diesels.

Market Memo

Dec. 19, 1960

Subfreezing weather in the Midwest and East Coast is just what the doctor ordered for sick demand and prices of kerosine, No. 1 and No. 2 fuel oils.

It gave firm support to the one-quarter cent per gallon price increase made earlier in the month in Chicago on No. 1 and No. 2. Their postings now are 10.5 and 9.75 cents per gallon respectively.

The posted price for 92-RON gasoline remains unchanged at 12.625 cents with discounts of one-quarter to one-half cent not hard to find.

Middle distillates out of Group 3 for northern shipment have moved up in price. All but one refiner is posting new lows of 9.5 cents for No. 2 and 10.5 cents for No. 1 and 10.625 cents for kerosine. Posting on 91-RON gasoline holds at 12.5 cents despite discount offerings from a few sources.

Improvement in middle distillate prices along the eastern seaboard also is expected to follow Esso Standard's upward price revisions last week. Voluntary discounts have prevailed in the area during the past few months.

Gulf Coast refiners expect this improvement in middle distillates to filter down to them too. This area has had no price changes in any products since late in July, and No. 2 fuel is still carrying its mid-June price tag of 8.25 cents. Kerosine, posted at 9 cents, figures from time to time in interrefinery swap deals for No. 2 with full price differential of three-quarters cent per gallon. Spot purchase demand has been lacking on all products from the Gulf Coast with the exception of Bunker C fuel. And there's still no price changes and no buyer demand for Gulf Coast gasoline, posted at 11.25 cents for 92-RON.

Inactivity continues in River markets. Inquiries, however, are beginning to pick up for No. 2 as result of weather. River suppliers now are more prone to hold for seasonal one-quarter to three-eighths cent over Gulf Coast lows.

Few calls are heard on the river for gasoline. It takes one-quarter to one-half cent off Gulf Coast postings to close a spot barge deal for up-river movement.

Refinery operations are getting back into line. Runs have been above 8,000,000-bbl. daily mark for only 1 week out of last 12...Drop in stocks of four major products last week was larger than decrease for same week last year...Gasoline stocks have declined for past 2 weeks—and normally they go up in December.

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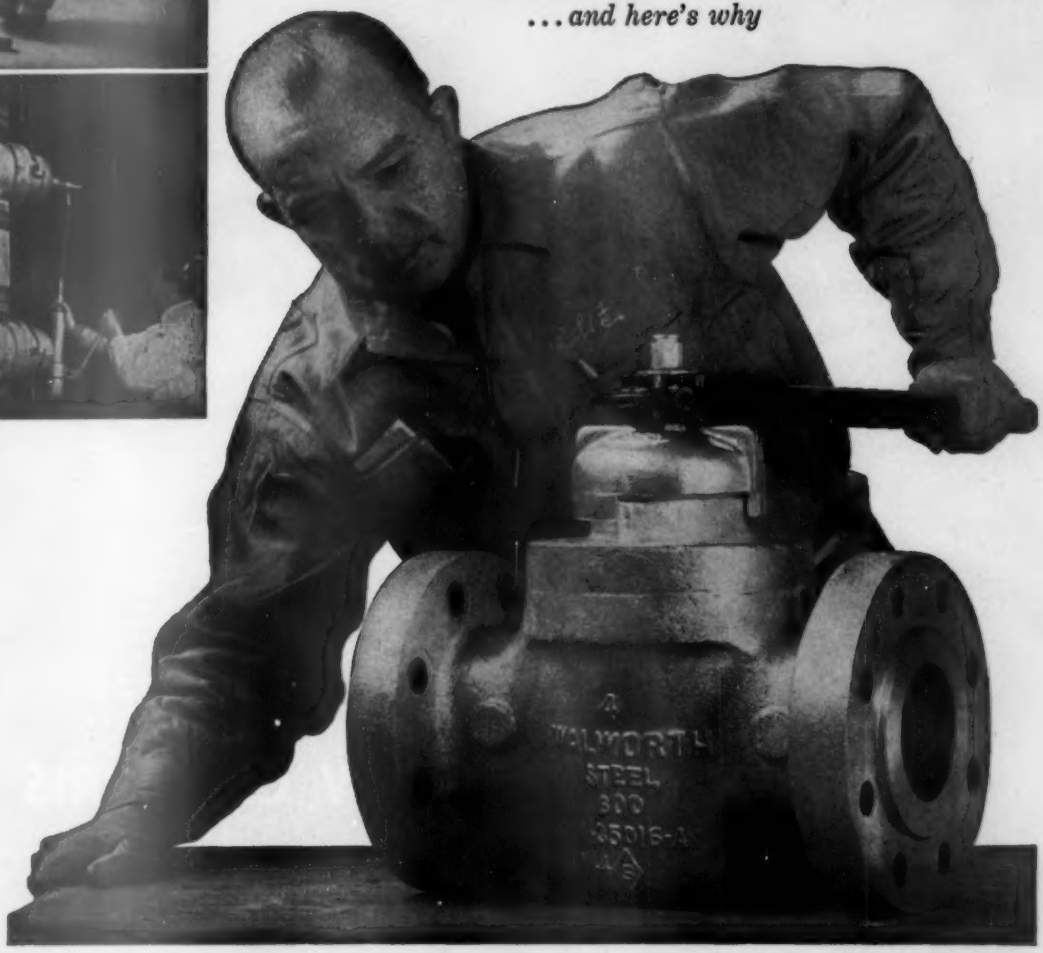
wants a quick operating, sure, tight valve. He chooses a

WALWORTH LUBRICATED PLUG VALVE

... and here's why



When the Walworth Customer has to decide on a valve that will close fast and easily, he wants to know HOW fast... HOW easily. Tight closure? Of course. But can the valve be serviced under pressure? Yes. Still, he tries one himself.

In the Walworth Lubricated Plug Valve he finds 100% tight closure because it is lubricant-sealed against leakage. He finds it opens or closes with a quarter turn. Then, and only then, he's ready to buy. If that's the way you like to buy valves, become a Walworth Customer. For details on all types and ratings of Walworth LPV's, write Walworth Company, Lubricated Plug Valve Division, 3517 Polk Avenue, Houston 23, Texas.

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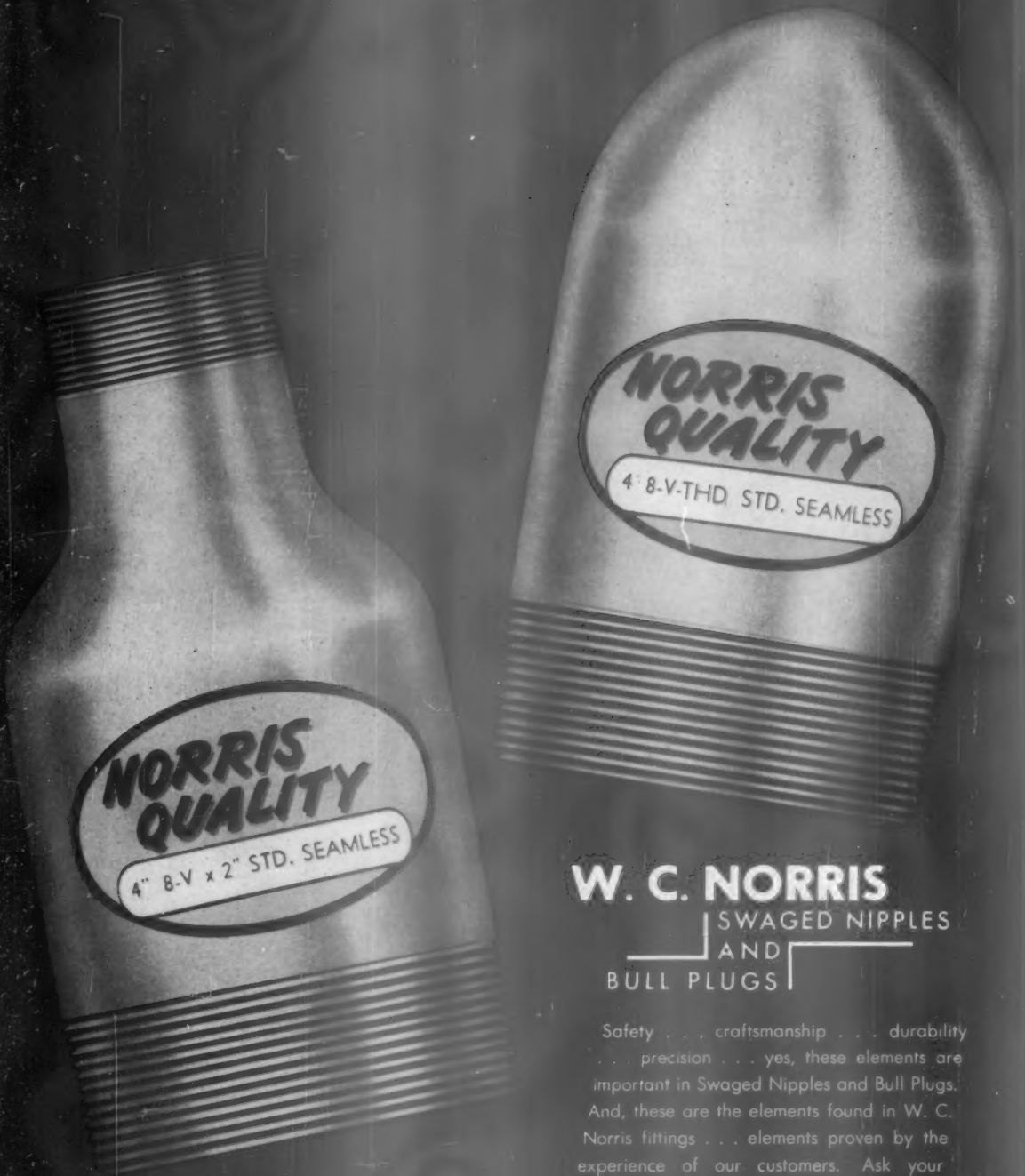

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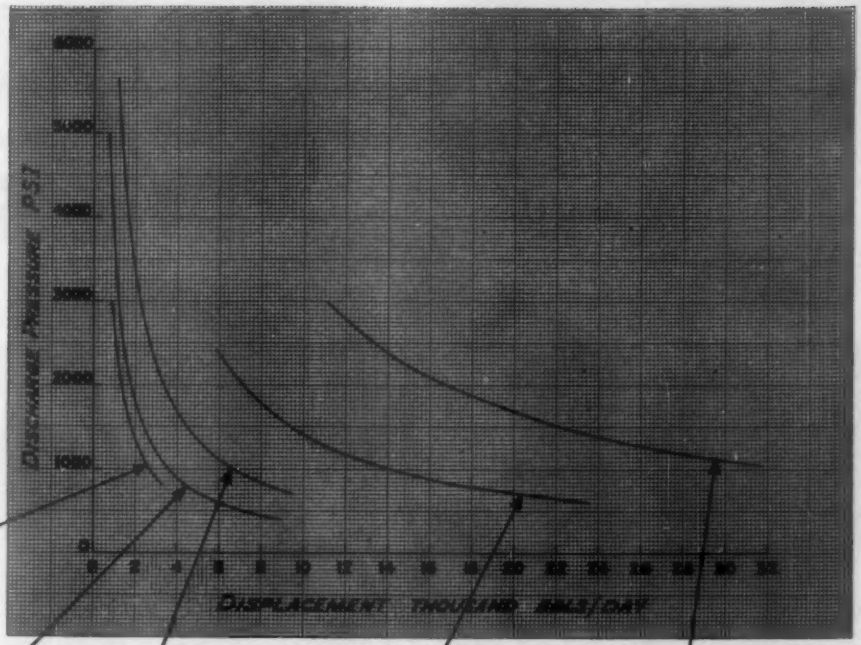
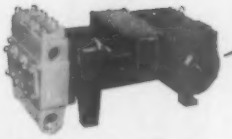
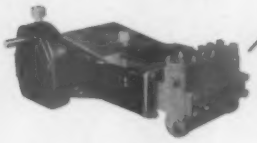
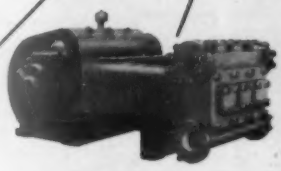




3" **Triplex** From 820 to 3,279 bpd at 3,000 to 815 psi with 51 hp



4" **Triplex** From 708 to 8,970 bpd at 5,000 to 400 psi with 66.8 hp



6" **Triplex** From 525 to 9,480 bpd at 5,850 to 705 psi with 125 hp

8" **Triplex** From 5,890 to 23,600 bpd at 2,410 to 600 psi with 266 hp

8" **Quintuplex** From 11,080 to 31,725 bpd at 3,000 to 1,050 psi with 630 hp

Sizing the best pump for your Fluid-Injection Applications

. . . is a relatively simple matter with the new selection manual on plunger pumps just published by "Oilwell."

The characteristic curves above indicate the wide ranges of volume and pressures available in the present "Oilwell" line of five primary pump sizes. In the selection manual you will find complete performance data for all plunger sizes available for use with each size pump.

We invite you to send for your copy of "Plunger Pump Selection Manual" (M29-1060) on your oil company letterhead. Take advantage of our time-proven experience and services. Thirty-three years of plunger pump building know-how for this service enable us to meet a wide variety of different applications, including abrasive slurries, corrosive salt water or liquified petroleum gas.

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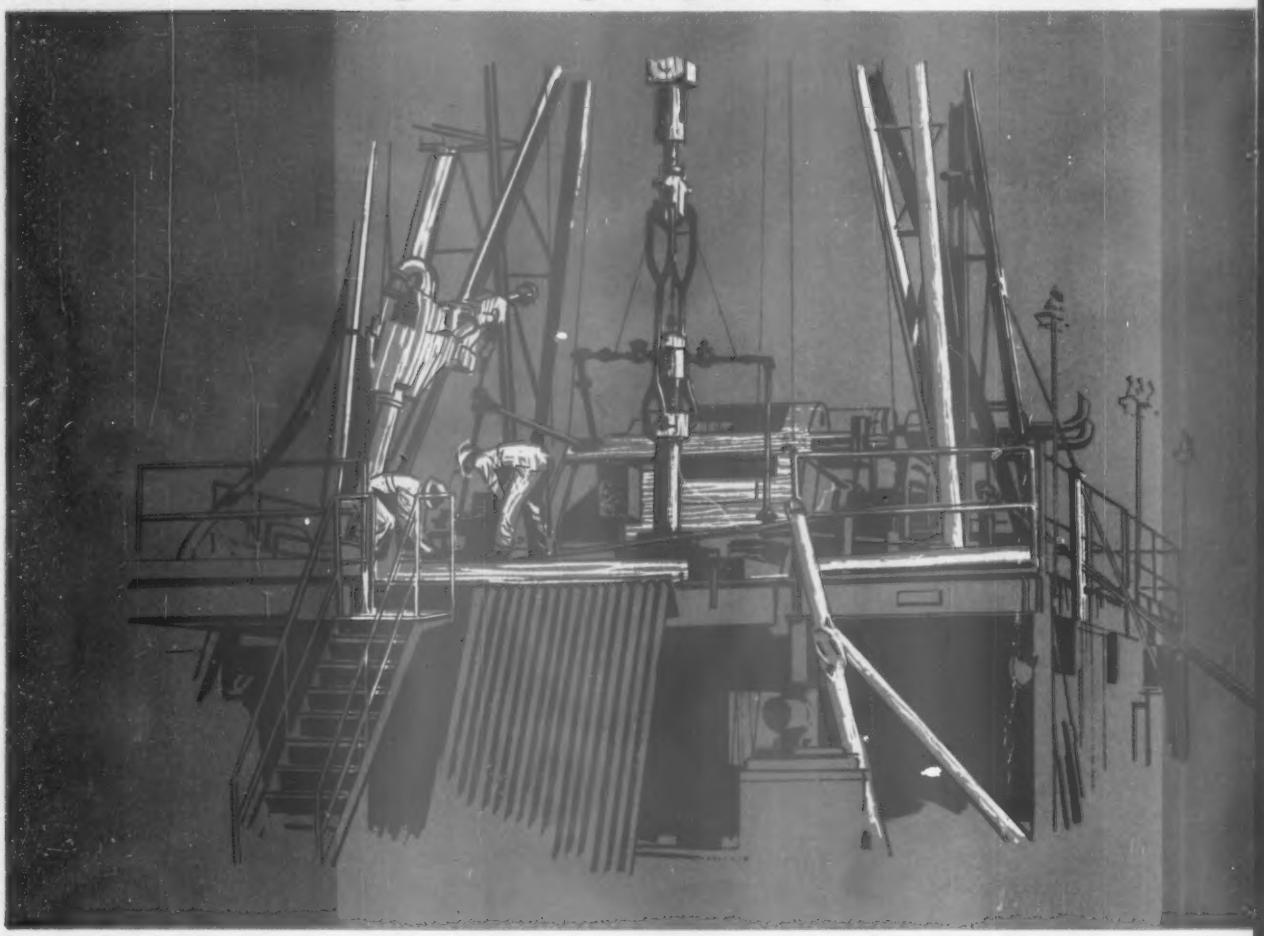
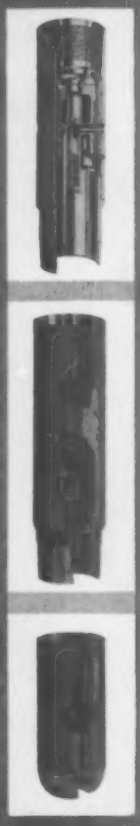


Here is another way Halliburton helps you combat well completion problems. In addition to the multitude of special cements and additives—the advanced equipment—the skilled personnel . . . Halliburton also provides a complete selection of Casing Floating, Guiding and Self Fill-Up Equipment. From this large line of proven performers, you can custom design a cementing string that will best fit your specific requirements—everytime.

275 HALLIBURTON SERVICE CENTERS JUST MINUTES AWAY FROM YOUR WELL

. . . with Halliburton FLOATING AND GUIDING EQUIPMENT



HERE'S A GOOD EXAMPLE: In completing a deep well in West Texas, one operator used three Halliburton tools on the string of casing to save time and money. He chose:

1. **THE SELF-FILL DIFFERENTIAL COLLAR**— to automatically fill the casing above the top float collar to maintain a balanced fluid head inside and outside the pipe . . . helping to protect the casing from collapsing.
2. **THE SUPER SEAL FLOAT COLLAR**— to provide a fluid barrier inside the string as it was run . . . taking part of the strain off of the derrick by partially floating the string to bottom.
3. **THE HALLIBURTON GUIDE SHOE** — to help direct the string away from ledges and other obstructions such as hard shoulders and crooked holes to minimize side-wall caving while running casing to bottom.

HERE'S WHERE SELECTION COMES IN: For wells where a medium range of differential pressure will be encountered, the operator could elect to use Halliburton's new INSERT SELF FILL-UP FLOAT VALVE instead of the Self-Fill Differential Collar as both perform similar functions. He could have substituted a less expensive INSERT FLOAT VALVE for the heavier-duty Super Seal Float Collar. In place of the Regular Guide Shoe, he might have used Halliburton's TURBO-JET GUIDE SHOE which is equipped with a fluid actuated rotor to provide high turbulence of cement slurry around the shoe — helping to keep the well bore clean and provide a better distribution of cement around the shoe joint. The Turbo-Jet Shoe is also available with a built-in back pressure float valve.

THE POINT IS . . . Halliburton has developed the tools that will best fit your specific well completion requirements. These described above are just a few of Halliburton's Floating and Guiding Casing tools. Your nearby Halliburton man can show you all the rest — and explain their many uses.

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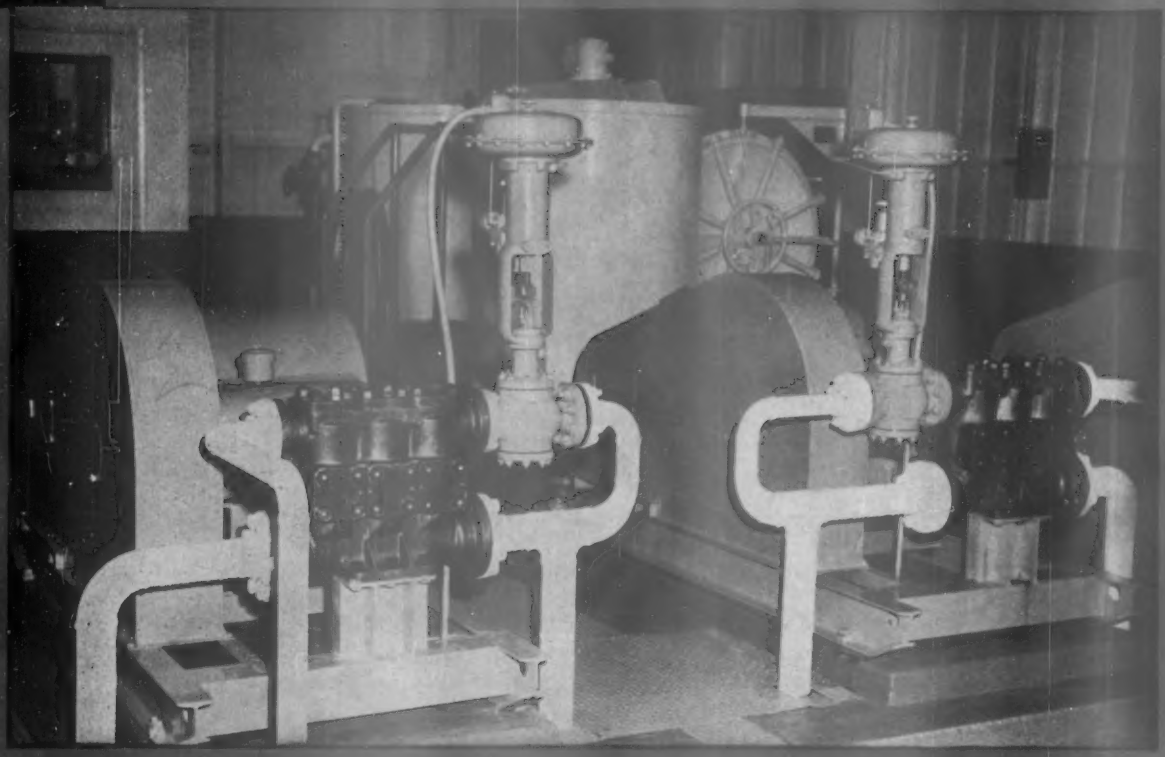
WORLD WIDE PREFERENCE

GASO PUMPS

WHAT'S BACK OF GASO LEADERSHIP IN

WATER FLOODING?



There's a Single-Word Answer: PERFORMANCE

The photograph shows one of a steadily mounting number of Gaso installations in water flooding service.

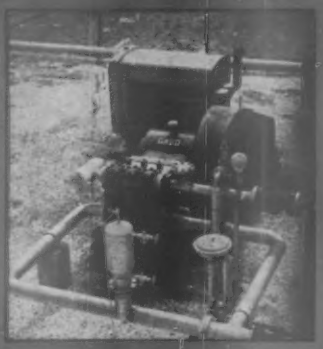
The injection pumps (3) are Fig. 3365, 1¾" x 3" Gaso Horizontal Triplex Plunger Pumps, driven by 40 HP 1200 RPM electric motors.

The fluid ends are of aluminum bronze fitted with ceramic plungers, non-adjustable type plunger packing (in both power and fluid ends) and Bakelite insert type valves mounted on Monel valve seats.

Each of the three pumps, operating at 350 RPM, delivers approximately 1075 barrels a day at 1500 pounds discharge pressure.

Complete adaptability to the job plus GASO design throughout is a time-tested guarantee of thoroughly dependable service extending far beyond the normal life expectancy of pumping equipment.

In the GASO line you will find the effective answer to any pumping problem associated with water flooding. Write for our 1960-61 catalog, or get in touch with our nearest distributor.



Gaso Pump in salt water disposal service in Louisiana

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Another new development using

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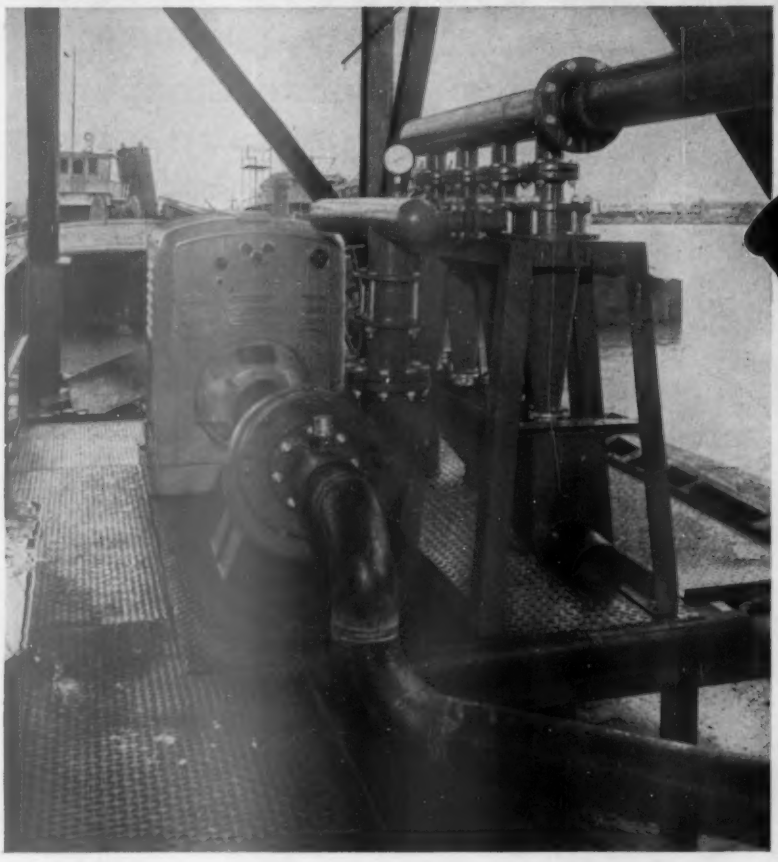


DEMCO Desanders made by Drilling Equipment Manufacturing Company, Oklahoma City, are equipped with Hycar liners molded by Wyatt Industries, Inc., Houston. One unit will treat 150 to 250 gallons of drilling mud per minute—units can be mounted in banks, as shown here, for additional capacity. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

Desanders demonstrate how Hycar withstands extreme abrasion in oil service

These desanders separate sand and cuttings from drilling mud by the cyclone method. Centrifugal force throws solids contained in fluid and oil against cone linings of Hycar nitrile rubber. Solids go to the outside of the cone and out the apex at the bottom, while liquids and lighter solids go to the center to be removed at the top.

Liners are molded to match the exact contours of the cones, which are designed for high-capacity operation. Sand and rock chips in oil really punish the liners. Hycar nitrile rubber easily handles this kind of abrasion.

Here's another example of the way that Hycar nitrile rubber solved oil field problems—by providing extra wear and resilience, as well as resistance to heat, oil, and corrosive influences that give trouble with many other types of rubber. It will pay to specify Hycar for your next application. For more information, write Dept. FH-12, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar

REG. U.S. PAT. OFF.

Rubber and Latex

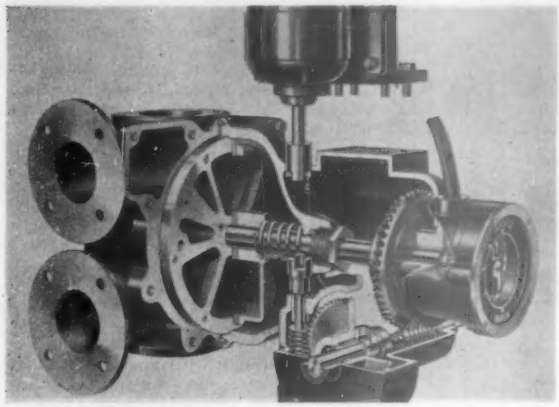
B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Leak-Proof Valve Lube

Chemical Resistance. A large Southwest petrochemical plant depends on Dow Corning Valve Seal to prevent sticking and leakage in hundreds of angle and safety relief valves on railroad tank cars . . . other valves throughout the plant. Inert Valve Seal won't react with or contaminate such chemicals as ethylene and propylene oxides, ethyl, methyl and vinyl chlorides, butylene and butadiene. In process plants, too, silicones help prevent corrosion . . . speed operations and ease teardown of equipment.



Water Repellency. Between rubber and bronze mating faces of valves in water conditioning equipment, this grease-like silicone compound provides an effective, leak-proof seal. With superior water resistance, the silicones protect parts from corrosion . . . increase service life and reduce maintenance. Silicones offer additional advantages: won't react with chemicals passing through ports, won't attack rubber or plastic parts, remain near-constant in viscosity in extreme temperatures.

Inert Silicone Compound Cuts Valve Maintenance

For a long lasting valve lubricant . . . specify Dow Corning Valve Seal, a non-melting silicone compound that remains grease-like from —40 to 500 F. *Chemical resistance . . . heat stability . . .* and *water repellency* are just three of many reasons for using Valve Seal. *Inert* and *nonoxidizing*, it offers advantages in numerous applications . . . on outside lines . . . in low temperature processing . . . on delicate equipment and recording instruments.

Heat Stability. From —40 to 500 F, Dow Corning Valve Seal stays on the job . . . won't melt, run off or gum up. This excellent thermal stability helps assure tight packing seals on shafts of seven 2-speed mixers in a hydrocarbon section where temperatures range from 10 to 200 F. In the mixers where cuprous ammonium acetate and butadiene are combined, nonreactive silicones keep a tight seal and prevent contamination in the lines. Dow Corning Valve Seal also provides excellent resistance to oils and oxidation.

Inert, Nonoxidizing. In contact with most chemicals or oils . . . in high heat or cold . . . in hot water or low-pressure steam . . . Dow Corning Valve Seal has been proved successful as a sealant, and lubricant. Applications include plug valves, control valves, flow meter bearings, plugcocks . . . other assemblies . . . pump packing impregnation. Valve Seal is available in 2-ounce and 8-ounce collapsible tubes, and in bulk containers of 10 pounds and 50 pounds. Investigate today.

For complete data on all silicone products, contact the Dow Corning office nearest you. Address Dept. 6212a.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

How CB/S Compressor Designs Solve Your Problems in Gas Lift

CB/S
PACKAGED
COMPRESSORS

The C-B/Southern salesman is an experienced production engineer, whose know-how is incorporated in the design of gas lift compressor plants. His understanding of your lifting problems: gas injection depth, pressures needed and gas fluid ratios, help you select the exact gas lift compressor plant needed for maximum efficiency with either continuous or intermittent flow. This application experience coupled with engineering and manufacturing knowledge built more than 40,000 compressor plant horsepower last year. A phone call, a wire, or a letter is all it takes to put this experience to work for you.

To further help solve your gas lift problems C-B/S packaged compressor plants are available in horsepower ratings from 100 to 1440; unitized compressors, both reciprocating and centrifugal, to 10,500 horsepower.

CB/S

C-B/Southern, P. O. Box 19267, Houston 24, Texas · HOmestead 8-5441

A division of The Cooper-Bessemer Corporation

MANUFACTURERS OF PACKAGED COMPRESSOR PLANTS FOR GAS GATHERING, GAS LIFT, GAS INJECTION APPLICATIONS

FALK and STEELFLEX are Registered Trademarks

Cut disconnect-reconnect time by as much as 50%

The FALK Spacer Coupling is specially designed for quick installation or removal *without disturbing the driving or driven unit.* This feature can save you up to 50% in disconnect-reconnect time when critical equipment—a process pump, for example—needs repair or replacement.

Here's another saving: with the FALK Spacer Coupling, you can quickly realign shafts *without the usual loss of operating temperature!*

And still another: you can remove or reinstall the FALK Spacer as a unit *without draining the lubricant.*

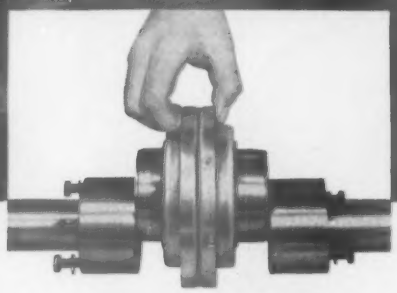
Because of its exclusive grid-groove Steelflex design, the FALK Spacer can accommodate residual misalignment—parallel, angular, or (most important) *both.* Also, it provides torsional resiliency that cushions shock and vibration. Thus it saves wear-and-tear on your connected equipment.

To prove these claims and enjoy these savings, install a FALK Spacer on one application—and see for yourself. Consult your FALK Representative or Authorized Distributor.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in many principal cities.

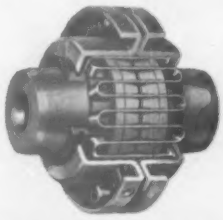


EASY AND QUICK TO INSTALL, DISCONNECT OR RECONNECT

First, mount shaft hubs to allow proper distance between hubs; then, align driving and driven units.

Second, compress Spacer to fit space between hubs and tighten cap screws to pull spacer hubs into the registered fit.

To disconnect, reverse the second step. No draining of lubricant necessary.



The heart of the FALK Spacer ...the basic Type F Steelflex

Write for Service Manual 4838

FALK

...a good name in industry

CHECK OIC FIRST...IT PAYS!

DEPENDABILITY is the *first* consideration when you choose a valve, because the cost of valve failure in down time is almost always greater than the cost of the valve itself. That's why so many of the best distributors sell the OIC line. They know that when they recommend OIC valves, their customers can depend upon them...even in those tough problem installations. Equally important is the distributor's own dependability... his capacity to deliver the valves you need, when you need them. Here, OIC offers the support of a complete factory inventory of bronze, iron, ductile iron, cast and forged-steel valves. You get immediate delivery from your OIC distributor's representative stock, and 4 to 5-day delivery from warehouse or factory. For dependability of product and service, phone your OIC distributor. He has our all-out support in serving you.

OIC VALVES

FORGED AND CAST STEEL, BRONZE, IRON AND DUCTILE IRON VALVES

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

News! The best features of
modern bearing design combined and refined in

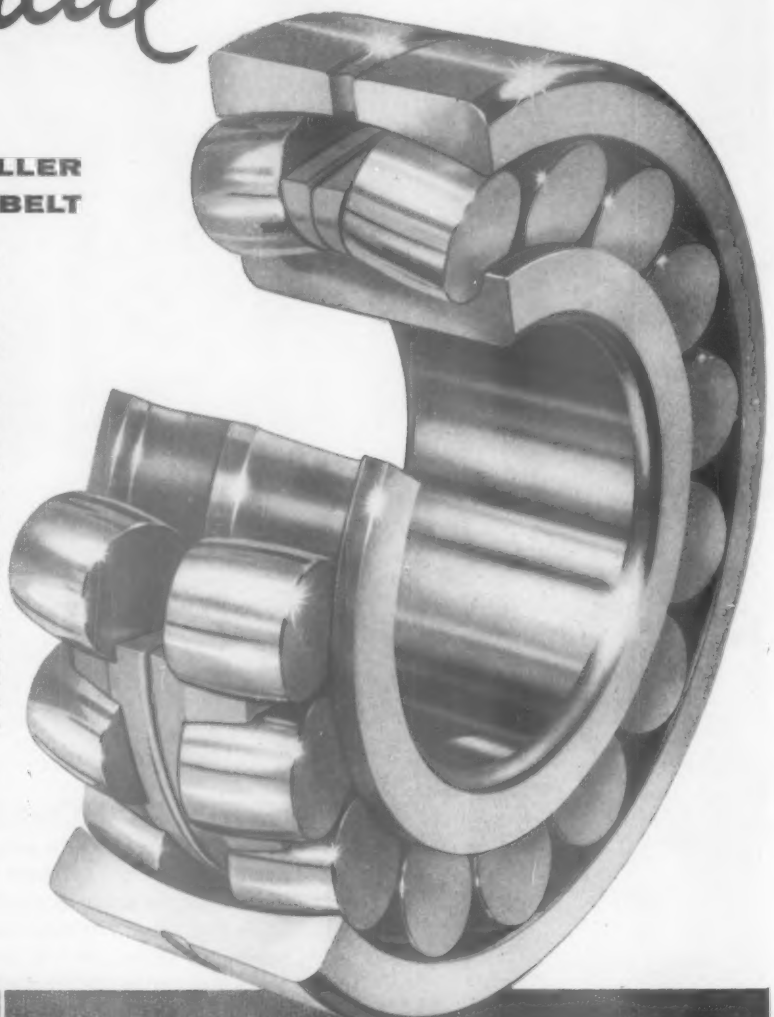
Spherical

SELF-ALIGNING ROLLER BEARINGS BY LINK-BELT

BIG, mirror-smooth convex rollers *plus* heavy, broad-shouldered inner race *plus* centrifugally-cast bronze, precision-machined retainers! Only from Link-Belt do you get ALL that is best in modern bearing design.

Individually, these elements represent major improvements on accepted design concepts. Collectively, they constitute the most efficient spherical roller bearings available . . . promise unequalled economies, whatever the application.

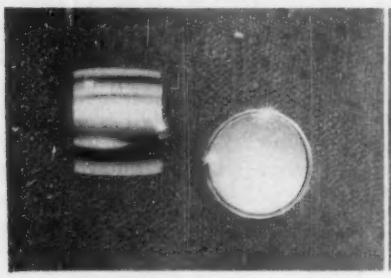
Your Link-Belt office or authorized stock-carrying distributor will gladly explain the many performance advantages evolved with this new design. And either can furnish full data on industry's most complete line of ball and roller bearings . . . pillow blocks and flanged, flanged-cartridge, cartridge and take-up blocks.



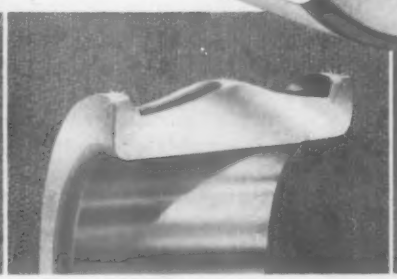
LINK-BELT

MANUFACTURERS OF SELF-ALIGNING BALL AND ROLLER BEARINGS

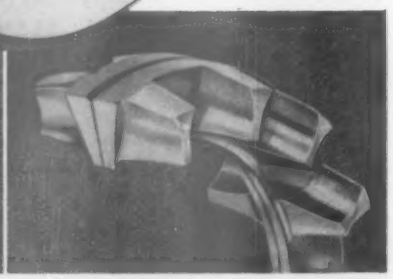
LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,010-B



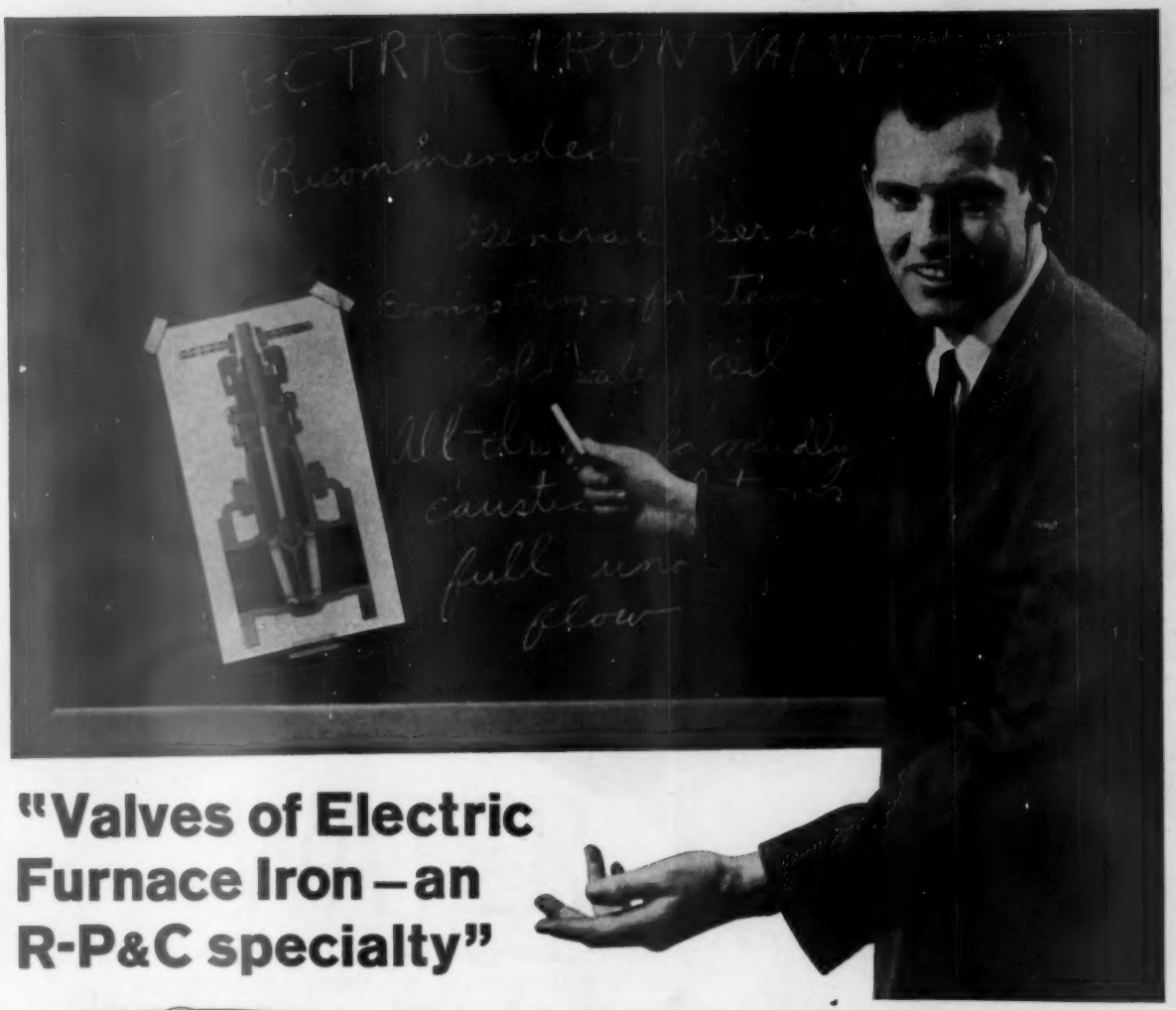
BIG, HIGHEST-CAPACITY ROLLERS. Each bearing has a maximum number of rollers—as large as possible, yet all components are in optimum balance.



HIGH, HEAVY INNER RACE FLANGES present convenient hold for assembly and removal of bearing without cutting away shaft, avoid any need to skimp on shaft shoulders.



PRECISION-MACHINED, CENTRIFUGALLY-CAST BRONZE RETAINERS have many times more support and ability to withstand high stress. They are not stampings. Design assures maximum bearing efficiency.



"Valves of Electric Furnace Iron—an R-P&C specialty"

"Manufacturing castings from iron melted in our own electric furnaces and to our own specifications has long been an R-P&C specialty. Recognized for their superior quality, these castings of **highly refined metal** are substantially free of impurities. Dense grain structure gives them a high resistance to corrosion, high tensile and transverse strength, plus excellent deflection characteristics. In fact, their **physical properties far exceed** the standard requirements for iron valve castings. And all of these advantages are available to you in R-P&C Electric Furnace Iron Valves at no extra cost."

Shown here is an R-P&C Gate Valve of the flanged end type. It is available in sizes from 2" to 24" in bronze trim or all-iron construction. The R-P&C Iron Valve line includes other popular types of Gate, Globe, Angle and Swing Check Valves—all made of Electric Furnace Iron.

Contact your R-P&C distributor. He can supply you promptly with any Iron Valve you need as well as gate, globe, angle and check valves in bronze, cast steel and forged steel; all in a wide range of sizes, styles and pressure classes. See him or write...

R-P&C VALVES

ACCO

R-P&C Valve Division, American Chain & Cable Company, Inc.

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Naugatuck PARACRIL OZO

Now an oil-resistant rubber with **color**

...*any* color...*any* shade...for almost any rubber product

Color is a facet of function. Color identifies... emphasizes ...warns... attracts or repels.

Color, properly used, is beauty. Color appeals. Color *sells*.

And now *all the color you can use* is yours in a synthetic rubber compound so tough, so oil, chemical, weather, and ozone resistant, it actually outperforms other rubbers. No longer need you think in terms of gray, brown, and black for any weather-resistant rubber.

Paracril® OZO—a unique blend of acrylonitrile-butadiene rubber and vinyl developed in the Naugatuck Chemical laboratories of U. S. Rubber—is already demonstrating its product-improvement power in a wide range of highly successful applications. And it's ready and waiting to do the same for *your* product.

Take a look at Paracril OZO. Full information is immediately available from your nearest Naugatuck Representative or the address below.

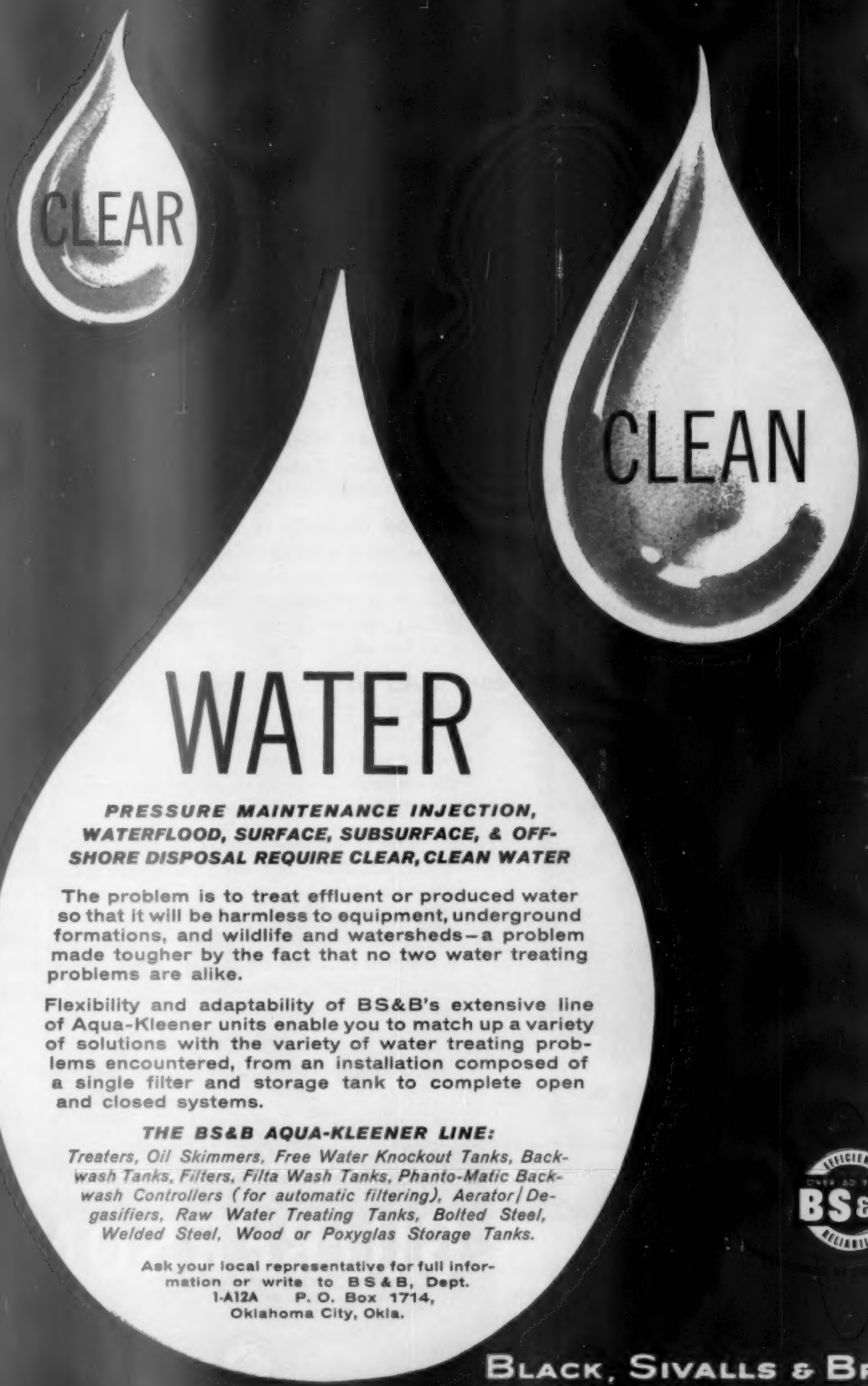
Naugatuck Chemical

Division of United States Rubber Company

1216P Elm Street
Naugatuck, Connecticut

US RUBBER

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.



PRESSURE MAINTENANCE INJECTION, WATERFLOOD, SURFACE, SUBSURFACE, & OFF-SHORE DISPOSAL REQUIRE CLEAR, CLEAN WATER

The problem is to treat effluent or produced water so that it will be harmless to equipment, underground formations, and wildlife and watersheds—a problem made tougher by the fact that no two water treating problems are alike.

Flexibility and adaptability of BS&B's extensive line of Aqua-Kleener units enable you to match up a variety of solutions with the variety of water treating problems encountered, from an installation composed of a single filter and storage tank to complete open and closed systems.

THE BS&B AQUA-KLEENER LINE:

Treaters, Oil Skimmers, Free Water Knockout Tanks, Backwash Tanks, Filters, Filta Wash Tanks, Phanto-Matic Backwash Controllers (for automatic filtering), Aerator/Degasifiers, Raw Water Treating Tanks, Bolted Steel, Welded Steel, Wood or Poxyglas Storage Tanks.

Ask your local representative for full information or write to BS&B, Dept. 1-A12A P. O. Box 1714, Oklahoma City, Okla.

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GUIBERSON

DRILLABLE BRIDGE PLUGS.. *leave no steel in well when set..short.. easy and fast to drill out*

TYPE B
(Cast Iron)

TYPE WE
(Cast Iron)

Here's where they cut your completion costs..

FOR PERMANENT INSTALLATIONS

Bridge plugs of cast iron.

FOR TEMPORARY INSTALLATIONS

Bridge plugs of magnesium, covered with a plastic coating to resist corrosion.

WHERE HIGH PRESSURE IS BELOW PLUG

Types WE & WME bridge plugs have bridge in upper end. Bridge can be drilled out without disturbing upper slips, so plug remains set while pressures equalize and drilling resumes in complete safety. These plugs are wire line set.

CONVERTIBLE TO DRILLABLE CEMENT RETAINERS

Types B & BM have bridge in lower end which can be replaced by an inexpensive, effective check valve to convert plugs into cement retainers. Drillable drop balls are available to seal in mandrel when pressure work must be done above retainer.

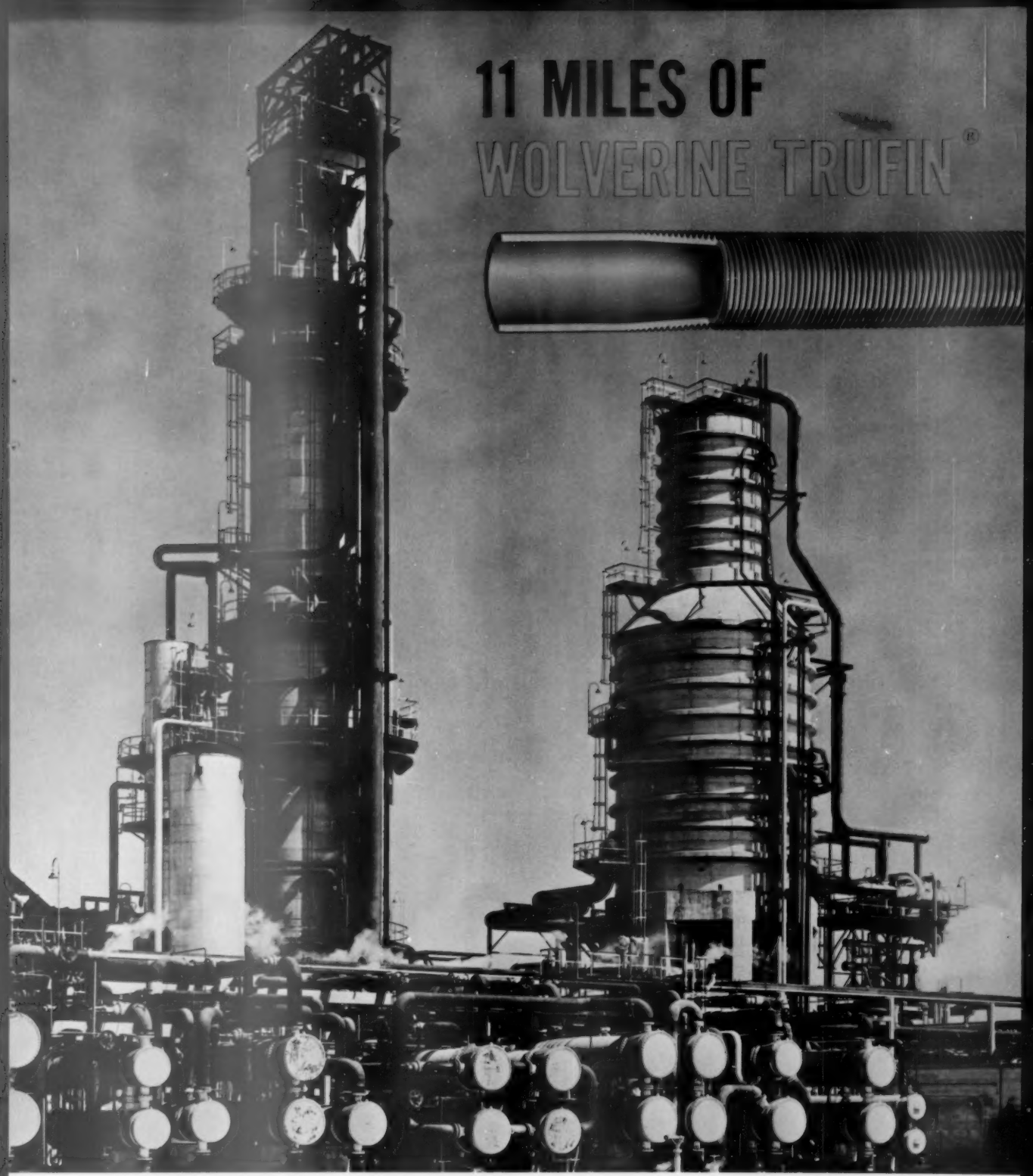
All parts of Guiberson bridge plugs are rigidly held in position. Shock and impact loads are transmitted directly to the mandrel while running in .. reducing the danger of premature setting. Slips are of special heat-treated cast iron. High grade special packing element is designed to handle the extreme pressures and temperatures found in deep wells. Bridge plugs and cement retainers can be set by wire line, tubing or drill pipe.

Sold by Oil Field Supply Stores Everywhere

Both plugs are also made in magnesium and are then designated as Type BM and Type WME

THE GUIBERSON CORPORATION

ESTABLISHED 1919 — DALLAS, TEXAS U. S. A.



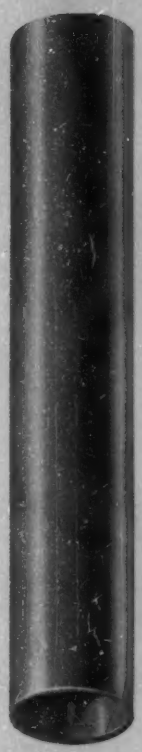
More than 11 miles of Trufin Type S/T–the integral finned tube–have been used in nine of the shell and tube heat exchangers which are the heart of the world's largest crude oil pipe still. Located in a midwestern refinery, the still is producing 140,000 barrels per day! More than 95% of the Trufin involved is made from Admiralty Brass.

Yes, 11 miles of Trufin is a lot of tube–but just visualize the space savings that Trufin has provided. To perform the same heat duty as Trufin, more than 20 miles of prime surface tube would have had to be used. The advantages are obvious–fewer tubes, fewer shells, much less space required, and more production.

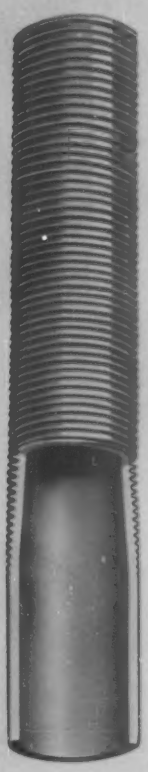
The complete range of finned tube products made by Wolverine Tube is shown on the other side of the page. It's a product line proven by experience.

Write today for more information.

Wolverine Tube manufactures the industry's most complete line of finned tube

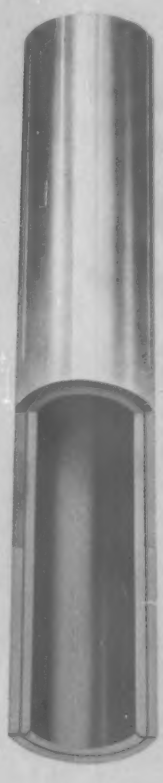


PRIME SURFACE TUBE



WOLVERINE TRUFIN TYPE S/T

WOLVERINE TRUFIN TYPE W/H



DUPLEX PRIME SURFACE TUBE

DUPLEX WOLVERINE TRUFIN, TYPE S/T

WOLVERINE TRUFIN TYPE L/C
Bimetal

WOLVERINE TRUFIN TYPE H/R

WOLVERINE TRUFIN TYPE H/A

WOLVERINE TRUFIN TYPE I/L

FINNED AND PRIME SURFACE U-BENDS
arranged in a disposable box-type pallet

LET US TELL YOU ABOUT IT

WOLVERINE TUBE
DIVISION OF
Calumet & Hecla, Inc.
DEPT. H, 17238 SOUTHFIELD RD., ALLEN PARK, MICH.
Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA • SALES OFFICES IN PRINCIPAL CITIES

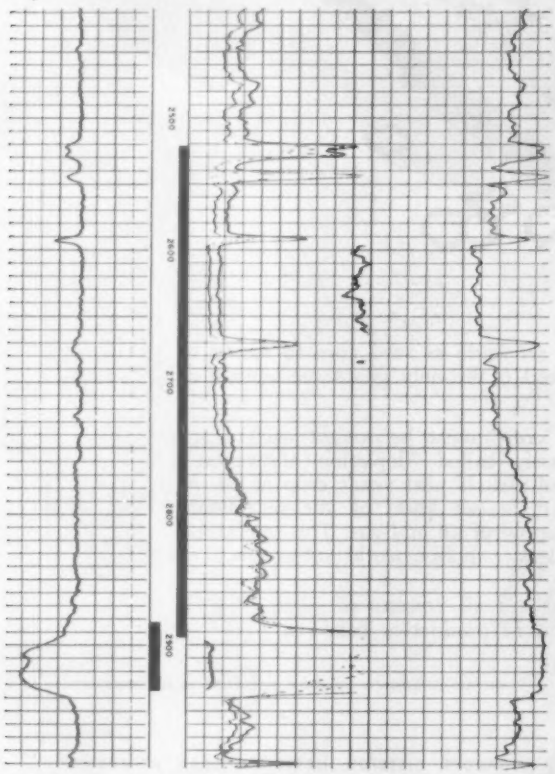
Here's How One Operator Solved Two Completion Problems and Saved Rig Time Too!

A rank wildcat, Stribling #1, was spudded in White County, Arkansas by Ambassador Oil Corporation with T.D. projected around 4500 ft. When the well was bottomed at 4511 ft., logs were run as the first step in evaluating formations and their producing potentials. A study of these revealed two interesting zones well up the hole. The logs indicated questionable permeability in sands above 3000 ft. and showed good departure of the resistivity curves.

Mr. A. J. Howell, Division Geologist for Ambassador, was faced with the problem of whether to set casing or not. A decision was made to run a Drill Stem Test. This, however, could mean serious trouble and add to the problems already encountered.

The area is notorious for subsurface conditions which vary from extremely hard sands to sloughing and swelling shales. Because of these conditions, fishing jobs are not uncommon.

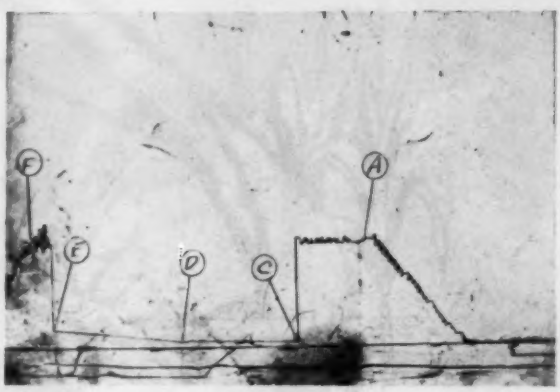
Trouble had already been encountered in getting logging tools in and out of the hole. To be absolutely safe, the operator wanted to test the formations without running a long tail pipe which might become stuck and require an expensive fishing job.

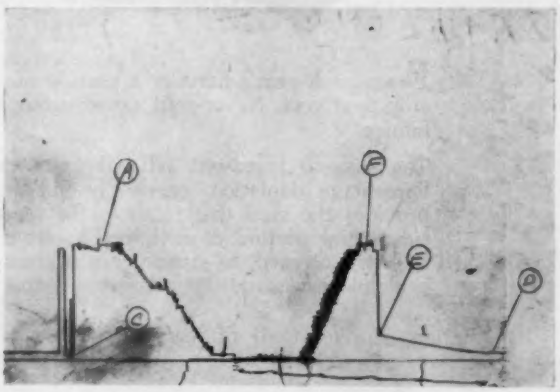


Johnston Testers solved two problems while testing the interesting formations. First, long tail pipe was not run during the tests because the new Johnston Selective Zone Anchor was used. Secondly, both zones were successfully tested. From the information gathered, it was decided that the formations definitely were not commercial producers and casing was not set needlessly in the well.

We quote from a letter written by Mr. Howell, "I would like to commend you for the excellent performance of both personnel and equipment in Drill Stem Testing our # 1 Stribling well in White County, Arkansas. Your Open Hole Selective Zone Tester worked perfectly in two Drill Stem Tests run at the well. From start to finish, both tests were run in less than 14 hours total rig time."

Because of the speed at which these tests were run, considerable rig time was saved, thereby reducing the overall costs.





Testing problems such as these are solved by Johnston every day. When you have a question about any zone... when you want formation information . . . call Johnston Testers!

JOHNSTON TESTERS

Houston, Texas Calgary, Canada

Number 1 of a Series

TELL THIS PETROLEUM INDUSTRY FACT TO YOUR NEIGHBOR

Don't eat the seed corn!

From each year's harvest, a portion must be set aside as seed corn to assure a crop next year. Never sold, never eaten, the seed is the only guarantee against a famine.

The same is true with oil and gas. A new "crop" must be *sought* each year. Percentage depletion, commonly but erroneously called "depletion allowance," provides the seed that finances the search and assures next year's crop of oil. A substantial portion of each year's income must be set aside by the petroleum industry, as seed, to guarantee a continuing supply of oil and gas. This operating principle has made the petroleum industry a leader in free world enterprise.

A nation deprives itself of its own future and penalizes all consumers when it deprives any industry of the seed that guarantees future productive harvests.

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BAROID

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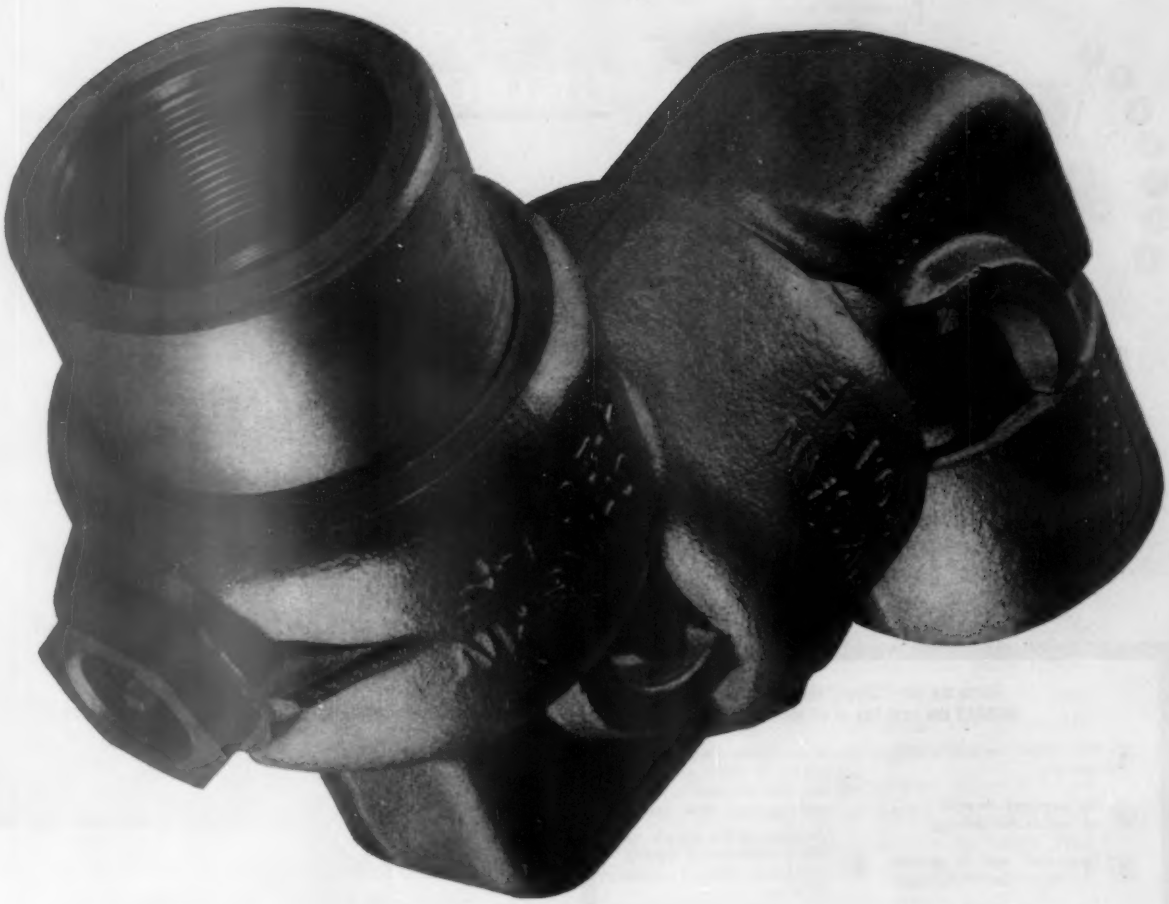
MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

BAROID—*Still Pioneering Drilling Mud Research • Engineering • Marketing*

Reproduction proofs of this message are available. Write Advertising Department, Baroid Division National Lead Company, P. O. Box 1675, Houston 1, Texas. 6099

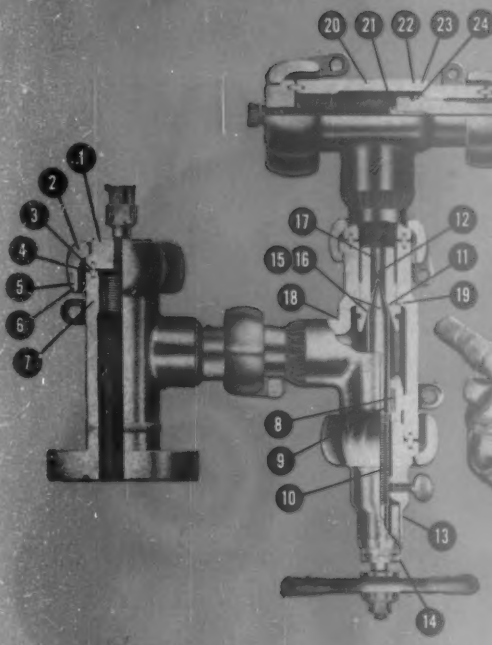


FOR EVERY PRACTICAL PURPOSE, this is the best swivel joint in the world. Its design basis is not the product of a limited applicability device, but rather of studied consideration for all applications. It is built to do the best job, with the least maintenance, for the longest period of time. It is a **CHIKSAN** Swivel Joint.

fmc

CHIKSAN COMPANY—General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Hamer Valves) • Chiksan International • Chiksan of Canada Ltd.
Offices and Representatives in Principal Cities of the World

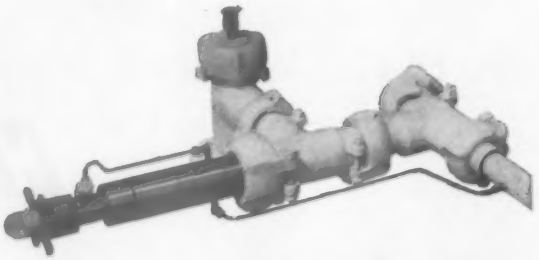
See how much more you get with a UNIBOLT Christmas tree flow manifold



These are the "Extras" that make UNIBOLT the best buy of all manifolds

1. Tee cannot be accidentally opened.
2. No exposed threads . . . no accidental damage.
3. Concealed seat in groove . . . no accidental damage.
4. All metal seat . . . not affected by high or low temperature.
5. Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt connection.
6. 2"—3000 lb. wp Unibolt 28% stronger than 2" — ser. 900 flange.
7. Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in tee if desired.
8. Stem packing needs no tightening.
9. Stem turns freely under high pressures.
10. Threads on stem not exposed to external or internal damage.
11. Full 2½" pilot for true stem alignment and rigidity.
12. Streamlined flow — no obstructions . . . no turbulence.
13. Wing Valve requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
14. Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
15. Nitride hardened stem and stem seat . . . resists corrosion.
16. Choice of hard chrome plated or "SA" stainless stems and seats.
17. Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. of fluid per day with 100 lbs. pressure drop.
18. Wing Valve can be completely overhauled without removal from tree.
19. Wing Valve stem seat sealed by power threads and metal gasket assure alignment.
20. Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated.
21. Shaped entrance on beans prevents paraffin clogging.
22. Positive Choke Body may be replaced with inexpensive tee and cage nipple.
23. Positive Choke Body can be converted to Adjustable Wing Valve by substituting two parts.
24. Beans and stem seats have external hex for wrenching.

In addition to these distinctive features, the UNIBOLT Flow Manifold eliminates impingement of flow and negative pressure areas. It may be salvaged completely or as separate units. The three separate units provide flexibility in arrangement of connections. All parts are easily replaced in the field . . . all parts are interchangeable.



The valve in this manfold is the new UNIBOLT Pressurematic Valve which is a combination automatic high-low safety valve and manually-operated wing valve for choke changing.

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Fisher control valves are now available in high-strength Nodular (ductile) Iron bodies, that do the same job as steel valves . . . *for up to 23% less!*

Nodular Cast Iron has higher yield strength than steel. When overpressured, a Nodular Cast Iron valve will continue to operate satisfactorily without distortion, at a higher pressure, than a similar steel valve.

Ability to resist thermal shock compares favorably to steel. Nodular Cast Iron valves have been tested successfully at three times their rated pressure and their corrosion resistance is as good and generally better than cast iron or carbon steel.

Effective in temperature ranges of -20° F. to +650° F. and pressures up to 1,000 psi. Shock or impact characteristics are comparable to steel. Has more resistance to scaling in air at high temperatures than ordinary cast iron or plain carbon steel.

Would you like more information about this alloy?

SEND FOR TECHNICAL PAPER TM-5

NCI VALVE BODY SPECIFICATIONS

Body Styles—Double or single port globe bodies.
Body Sizes—½ through 12".
End Connections—Screwed, ASA raised face or RTJ 150 to 600 psi flanges.
Plug Style—Top and Bottom guided, V-Pup or Throttle Plug.
Pressure-Temperature Ratings—Pressure 80% of corresponding steel flanges at a given temperature with maximum pressure up to 1,000 psi and maximum temperature 650° F.
Minimum Temperature—Minus 20° F.

COMPARISON OF MECHANICAL PROPERTIES

	Cast Iron ASTM A126-B	Nodular Iron ASTM A395	Cast Steel ASTM A216-WCB
Tensile Strength, PSI	31,000 Min.	60,000 Min.	70,000 Min.
Yield Strength, PSI		45,000* Min.	36,000 Min.
Elongation, % in 2" Gage Length	NIL	15	22
Modulus of Elasticity, PSI	12—20x10⁶	24x10⁶	30x10⁶

*.2% Offset

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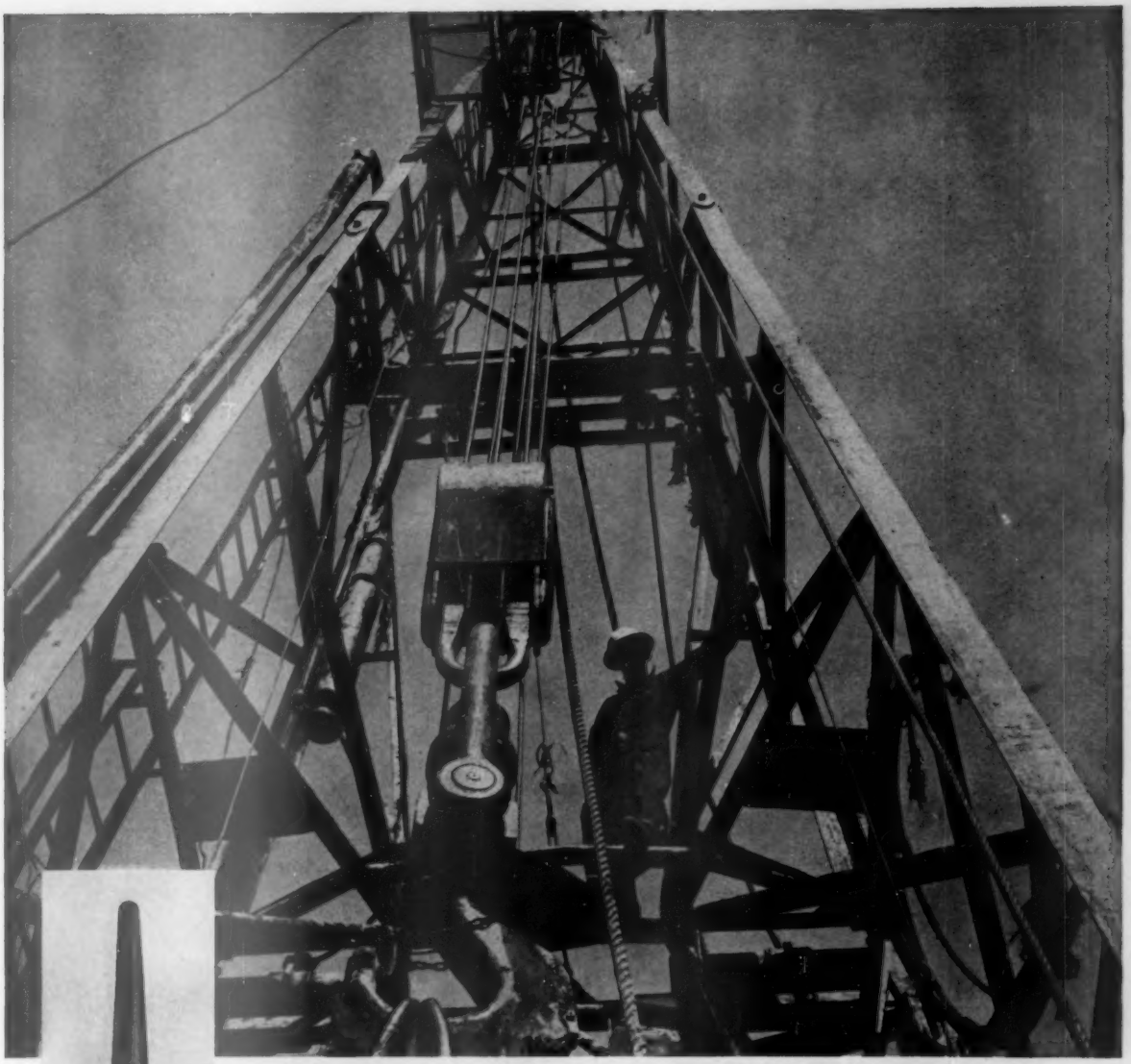

DEEPER AND DEEPER
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The deeper wells and advanced equipment required for today's oil recovery demand the finest in casing and tubing — CF&I Seamless Casing and Tubing. The CF&I mill at Pueblo uses equipment rated among the most up-to-date in the industry. Production techniques feature unusually exact quality controls.

From its central location, CF&I Seamless Casing and Tubing can be distributed rapidly to the major oil fields. All CF&I Seamless Casing and Tubing is made to API specifications, in sizes 2⅜" to 9⅝" O.D. For full details, contact your local CF&I Sales Office or our General Sales Office, Denver, Colorado.

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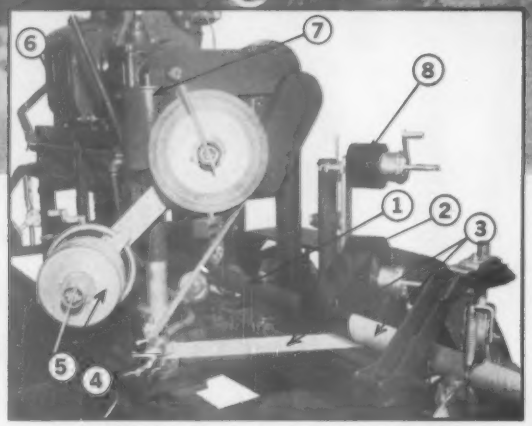
THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

NEW TECHNIQUE ASSURES PERFECT ON-SITE COATING



Pipe (coming toward you) spins through machine . . . undergoes dynamic cleaning from twin-powered brush heads. Coating comes off brake-type tape drum. Outer wrapping runs through fast-gluing adhesive attachment.

1. Spinning pipe
2. Polyken tape coating
3. Outer wrap
4. Glue applicator
5. Stand-by outer wrap turret
6. Power brush heads
7. Glue tank
8. Stand-by tape turret

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Your protective coating results are only as good as the material you use and the way you put it on. And with Polyken tape . . . plus the special, new Polyken way of on-site application . . . you get a combination that really does a perfect job —*simply, speedily, economically.*

Simplicity? Right! The completely mobile machine sets up in an hour (knocks down in half that time), uses 6 men or less for continuous cleaning, coating, and wrapping. Speed? You can process up to 20,000 lineal feet a day, take 10-minute breaks to switch pipe sizes. Economy? Look at it this way: You get *quality* tape, properly applied by a high-speed *quality* process. The result can't help meaning more *dependable* coating for your dollar.

For the full story on both machine and tape, see your Polyken representative. It can mean maximum protection at minimum investment.

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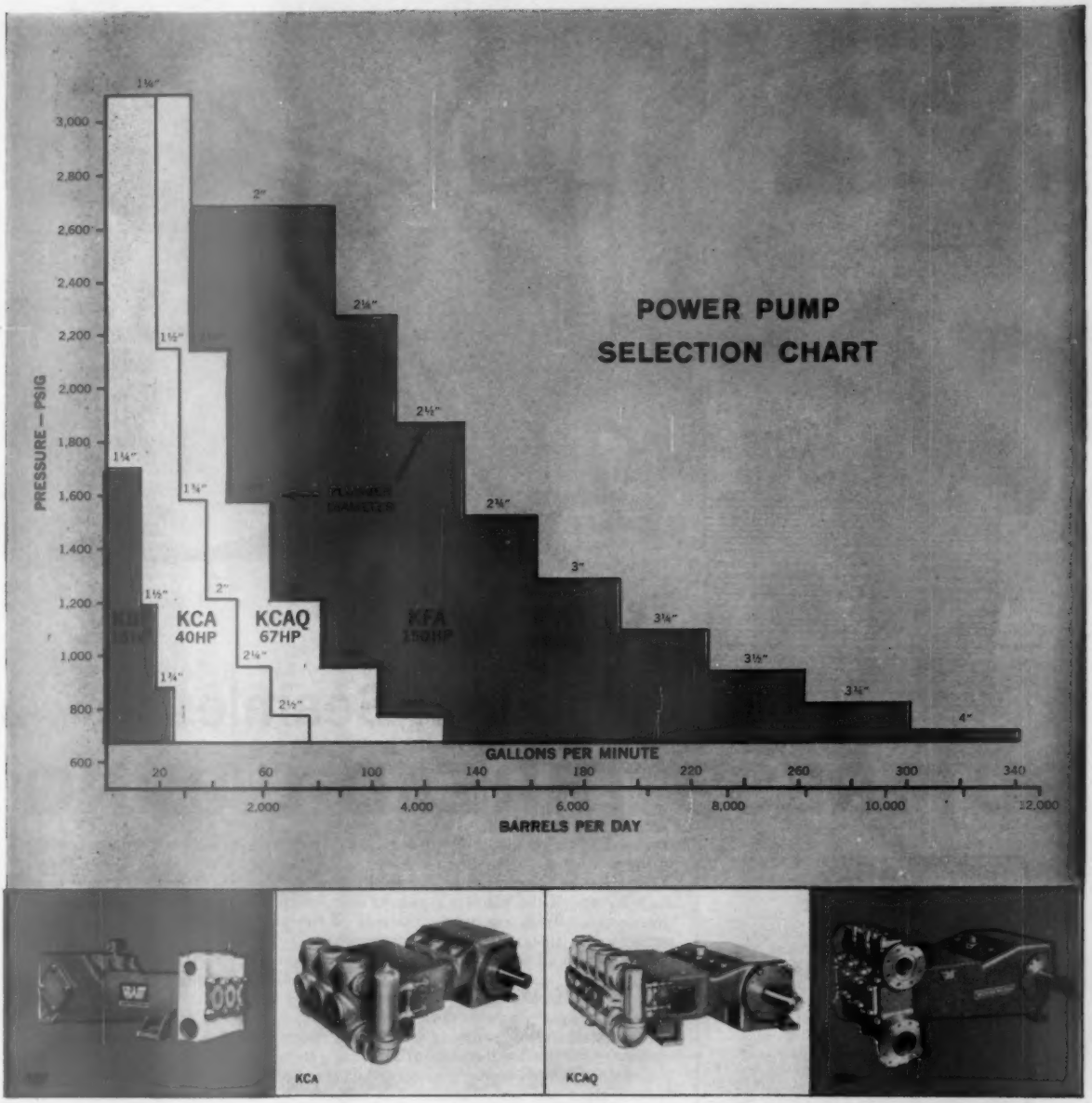
THE KENDALL COMPANY
Polyken Sales Division



NEW PUMPS EXTEND RATINGS

...to make Worthington your lowest cost high-pressure pump

This is the first public announcement of two new Worthington high pressure, reciprocating pumps. With nominal ratings of 15 and 150 hp, they complement existing pump lines rated at 40 and 67 hp. All are horizontal designs which save you up to 53% on initial cost.

These four pumps—each available in several interchangeable plunger sizes—allow you to buy the most economical amount of pump for your particular application. Should you require pumps of more than one rating, you save money on spares because many parts are interchangeable in the Worthington line.

More and more oil producers are choosing Worthington for waterflood applications. A Worthington representative would be glad to explain how this expanded line can save you money on many types of installations.

Get in touch with your nearest Worthington district office. Or write Worthington Corporation, Section 32-8A, Oil City, Pa.

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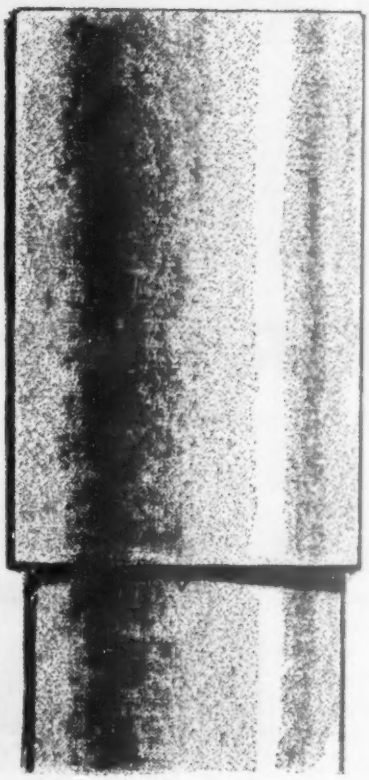
NEW!

Pittsburgh Seamless

BUTTRESS THREAD CASING



Deep wells you are planning call for special steels and special joint designs tailored to the job.

Such a safe, economical product is Pittsburgh Seamless Buttress Thread Casing made by one of the country's pioneer seamless producers. The threaded connection is virtually as strong as the body of the pipe. It can support long casing strings and withstand tremendous stresses.

Available in all popular sizes of outside diameters, new Pittsburgh Steel Buttress Thread Casing gains its extra strength from longer length of threads on casing and reduced flank angle of engaged threads. As a result, the load is distributed over the full pipe cross-section.

Rapid stabbing and spinning are assured. Since there is no internal upset, inside clearance is the same throughout the entire string.

Coupling threads engage casing threads throughout their entire length since the ¾-inch taper per foot is continuous without fast angle vanishing threads. Five threads per inch and the three degree flank angle of threads permit threads to support the full weight of casing in the well. Write for literature and further information.

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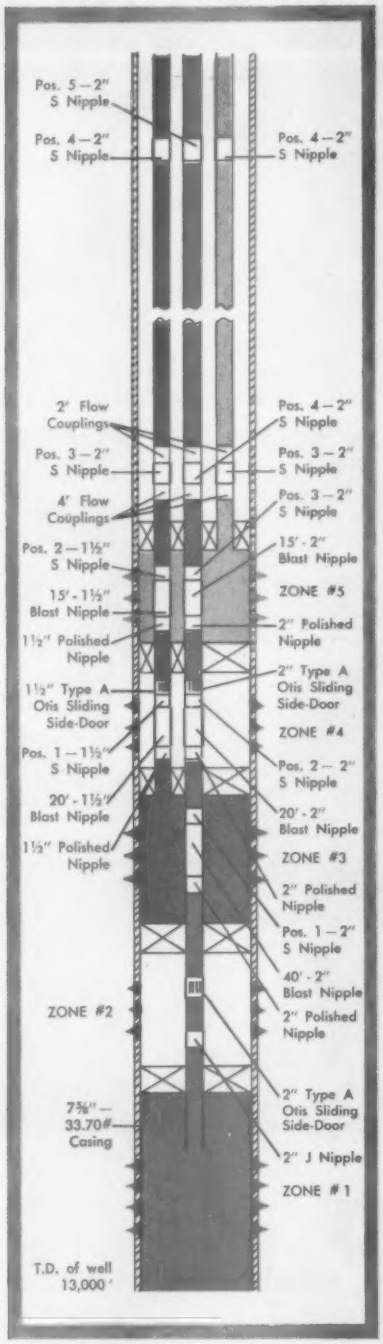
OTIS PRODUCTION NEWS

Volume II, Number 1 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*


Pos. 5 — 2" S Nipple
Pos. 4 — 2" S Nipple
Pos. 4 — 2" S Nipple
2' Flow Couplings
Pos. 4 — 2" S Nipple
Pos. 3 — 2" S Nipple
Pos. 3 — 2" S Nipple
4' Flow Couplings
Pos. 3 — 2" S Nipple
Pos. 2 — 1½" S Nipple
15' - 2" Blast Nipple
ZONE #5
15' - 1½" Blast Nipple
2" Polished Nipple
1½" Polished Nipple
2" Type A Otis Sliding Side-Door
1½" Type A Otis Sliding Side-Door
ZONE #4
Pos. 1 — 1½" S Nipple
Pos. 2 — 2" S Nipple
20' - 1½" Blast Nipple
20' - 2" Blast Nipple
1½" Polished Nipple
ZONE #3
2" Polished Nipple
Pos. 1 — 2" S Nipple
40' - 2" Blast Nipple
ZONE #2
2" Polished Nipple
2" Type A Otis Sliding Side-Door
7⅝" — 33.70# Casing
2" J Nipple
ZONE #1
T.D. of well 13,000'

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Alternate Zone Triple Completion Shows Economic Advantages of Using Otis Equipment and Wire Line Services

LAFAYETTE — This offshore, multiple-zone gas well, located off the coast of Southern Louisiana, illustrates the economic advantages of using Otis sub-surface flow control equipment and wire line services.

The cost of the installation, including the tubing safety valves, sleeves, nipples, and other Otis sub-surface equipment as shown in the accompanying diagram, totaled slightly under $12,000 — or about $65,000 less than what it would cost to move a workover rig onto the well to deepen it and recomplete the lower zones, had the well been drilled and completed differently. As equipped, this well can be produced until all five zones have been depleted, with only occasional wire line service to permit production from each of the different zones.

T.D. of the well was approximately 13,000 feet with five different zones of potential production below 12,600 feet. When called to engineer the completion, Otis specialists were asked to design an installation that would permit alternate production of three of the zones through the long string and one through each of the other strings, or two zones through the long string and two through the intermediate string, with the top zone to be produced through the short string.

Two single packers were used to isolate zones 1 and 2 and a Type A Otis Sliding Side-Door and Type J Otis Landing Nipple were made up in the tubing between the two packers. This arrangement will permit the bottom zone to be produced first through the long string, and then zone 2 by setting a Type PJ Otis Plug Choke in the landing nipple and shifting the sleeve in the Sliding Side-Door®. The Type PJ choke is designed to hold pressure from either direction.

A blast nipple with a Position 1 Type S Otis Landing Nipple above and a polished nipple below was designed into the long string opposite zone 3. This is the zone to be produced through the intermediate string. In the event flow from zone 3 should cut through the blast nipple, the landing nipple and polished nipple will be used to pack off the hole and permit continued production of either of the lower zones through the long string. The landing nipple above the blast nipple may also be used to land a plug choke in the event both lower zones deplete sooner than anticipated and the operator decides to produce zone 4 through the long string.

Otis sliding side-doors were designed into both the intermediate string and the long string between the packers isolating zone 4. This will permit selective production of that zone through either string of tubing. S nipples, blast nipples, and polished nipples were also made up on both the intermediate and long strings opposite zone 4 to provide the tubing with the same protection as described for zone 3.

In that this was a gas well, S nipples with flow couplings above and below were made up in all three strings of tubing, immediately above the top packer, to accommodate Type FS Otis Tubing Safety Valves. This provided Storm Choke® protection for each string. By locating the safety valves just above the top packer, the operator will be able to carry on a corrosion inhibitor program without pulling the safety valves. S nipples were also located in each string approximately 1,500 feet from the surface for plugging purposes until gathering lines could be laid.

This Otis-engineered completion was designed to provide the ultimate in economical, versatile, and efficient alternate-zone production. For more information on alternate-zone, multiple completions or for help with any other specific completion problem, call the Otis office nearest you or write Otis, Dept. 1-W, Box 35206, Dallas 35, Tex. Experienced Otis specialists are ready and anxious to provide you with a "packaged" well completion service.

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Engineering OTIS Corporation

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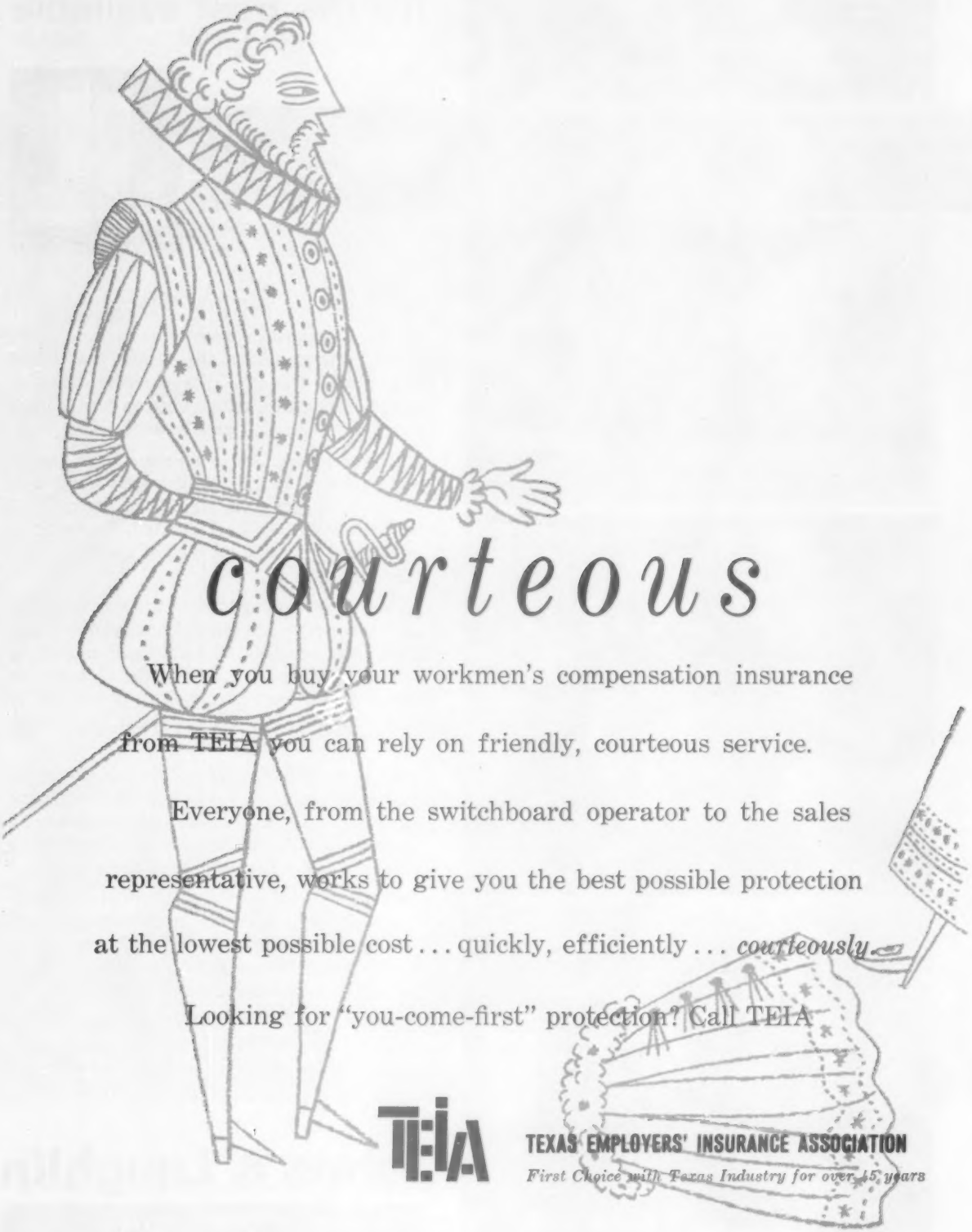

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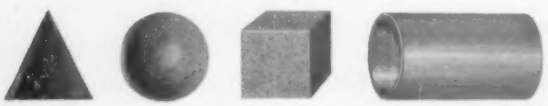

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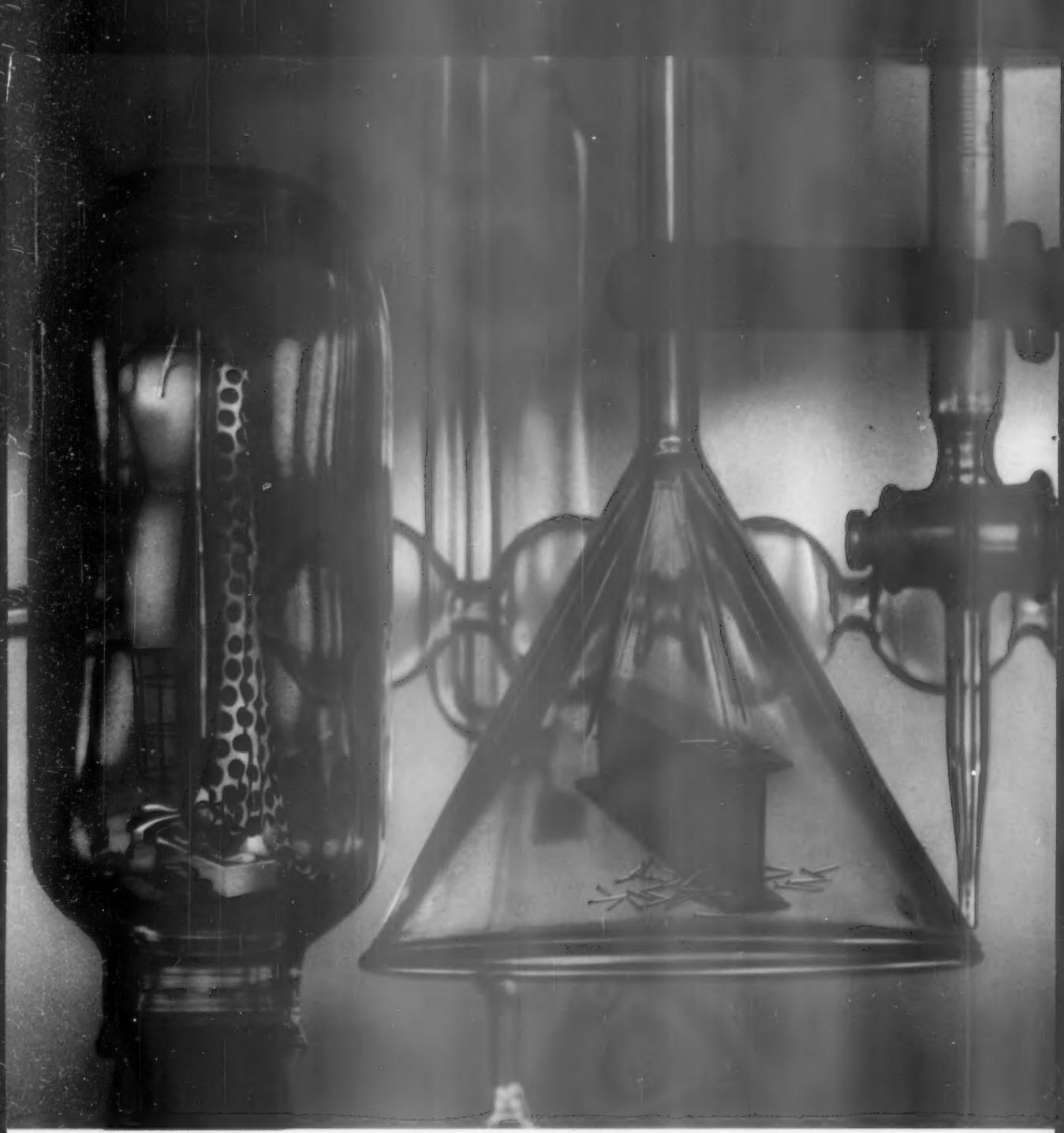

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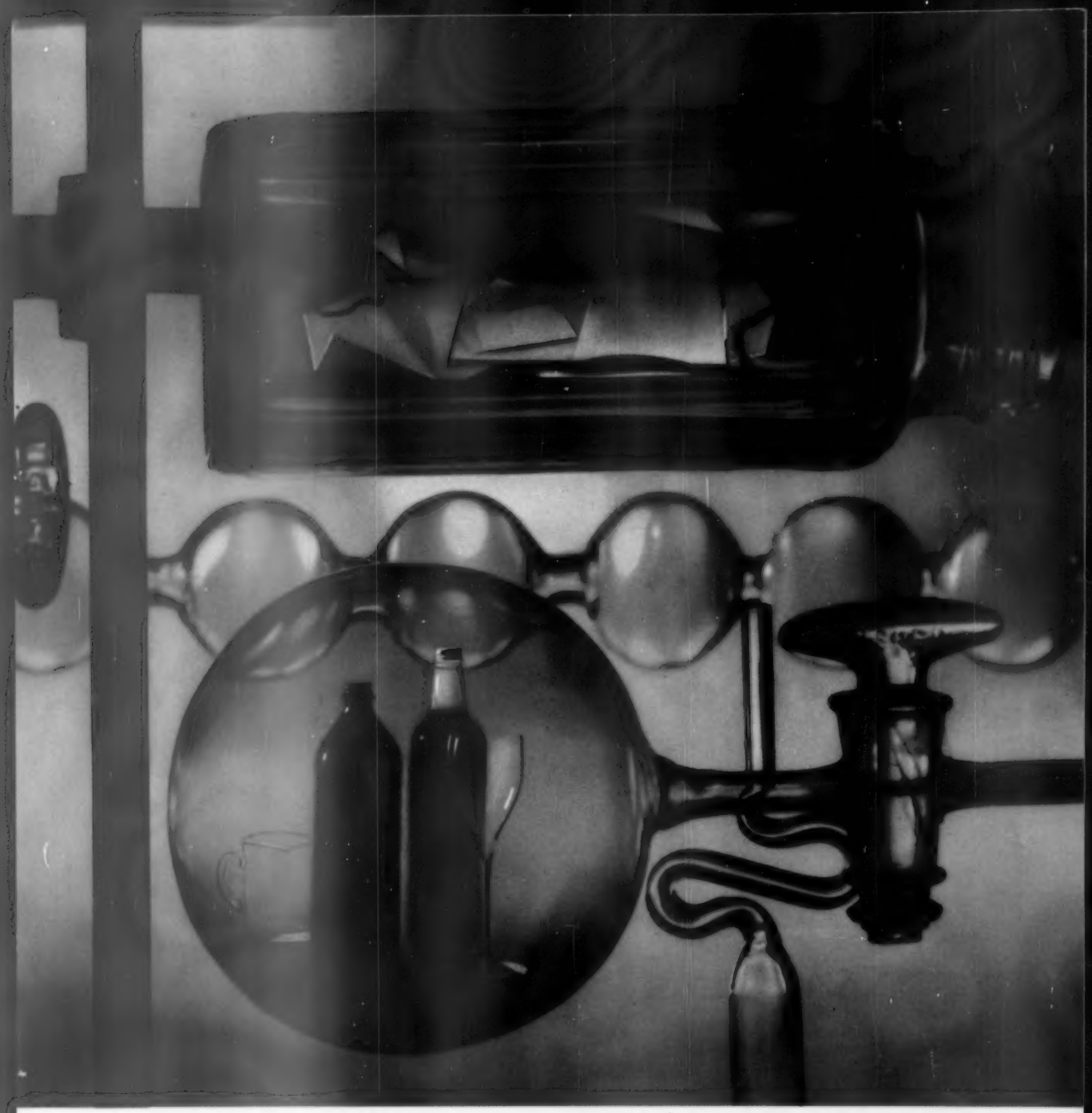

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Bethlehem makes flanged-and-dished heads to meet virtually every requirement: ASME Code, elliptical and standard flanged-and-dished. Also flanged-only, dished-only, shallow-dished, double-dished, and heads for special requirements.

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A number of suggestions that may help you to reduce costs are contained in our new folder "Pertinent Facts on Purchasing Flanged and Dished Heads." Factors that govern the price of heads are described; and a list of the required data for orders and inquiries is included. Ordering from our stock sizes at Sparrows Point, Md., may save you time and money; a full list is contained in the folder. A copy is yours for the asking at any Bethlehem sales office or write to us direct at Bethlehem, Pa.

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They Say—

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Dear Sir:

Your article, "The Industry May Soon Need a New Approach to Geophysical Methods of Finding Oil," (OGJ, Nov. 7, p. 208) is extremely interesting. I would like to know if copies of this article can be purchased.

George H. Miller
Geologist
Plymouth Oil Co.
New Orleans

No beaten path at his door

Dear Sir:

I read the article by Amalendu Roy in the November 7 issue with interest. ("The Industry May Soon Need a New Approach to Geophysical Methods of Finding Oil," p. 208.)

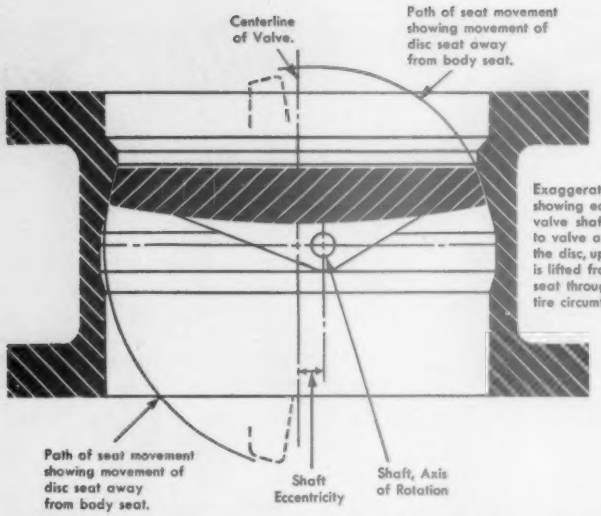
He expressed a song that I've heard over and over from many prominent people in the oil industry. In fact, many have said that what is really needed is a new and more direct way of finding oil than any in current use. Such a need is only too obvious when one realizes that the cost of locating oil in the United States is more than the stuff will bring after you do locate it.

Inasmuch as this need is so clearly recognized, why is it that the promoter of the new and unorthodox method of finding oil has such a terrific time getting a hearing or interview? Even then, prejudice is so strong that a fair and impartial consideration of the merit of the system or invention cannot be obtained.

Being the inventor of a new and unorthodox system, I know whereof I speak and can give many examples of this attitude on the part of management. I have even gone so far as to run free demonstration surveys which later were proven 100% correct when the areas were drilled out, and yet the district geologist, because of this hide-bound orthodoxy, credited the results to pure chance!

The man who wrote the story about the better mouse trap obviously never invented one. His story would have had a different ending if he had.

To help break down this prejudice I would like to see the industry set up a research group or committee to evaluate by test, under known conditions, new geophysical developments. The main purpose of such a group would be to check out the unorthodox


Centerline of Valve.
Path of seat movement showing movement of disc seat away from body seat.
Exaggerated diagram showing eccentricity of valve shaft in relation to valve axis and how the disc, upon opening, is lifted from the body seat throughout its entire circumference.
Path of seat movement showing movement of disc seat away from body seat.
Shaft Eccentricity
Shaft, Axis of Rotation

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methods, to weed out the frauds, and bring recognition to that which has real merit.

Patents are pending on my own inventions, on which approximately 15 claims have been allowed. One prominent geophysicist told me that even after my patent was allowed I would have one h . . . of a time to put it over regardless of its merit.

I hope that he is wrong, but I'm afraid that he will prove to be correct.

Donald Slattery
Slattery Geophysical Service
Loveland, Colo.

Editor's note: Southwest Research Institute, San Antonio, conducted just such an evaluation study as Reader Slattery suggests (OGJ, Dec. 22, 1958, p. 94). It studied 100 unorthodox methods and discovered that 66% of them had no value. Its 3-year project turned up no really effective method, but did leave the door open to possible new approaches through electricity, radio, magnetics, radioactivity, and geochemistry.

The Journal has consistently advocated "the open mind" concerning unorthodoxed methods and has not hesitated to present them in print (with no intent of endorsement) for the reader's evaluation (OGJ, April 1, 1957, p. 109; Nov. 11, 1957, p. 234; May 18, 1959, p. 391; June 8, 1959, p. 232; June 15, 1959, p. 154; Aug. 3, 1959, p. 130; Aug. 24, 1959, p. 120).

Research comes first

Dear Sir:

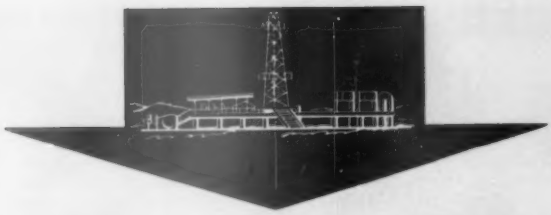
I was interested in your news report of the speech of Professor Theodore Levitt of Harvard (OGJ, Nov. 21, p. 134).

He seems to be beating the marketing people for not having effected major changes in the marketing methods of gasoline, etc. However, I think he overlooks the fact that every revolution in marketing has had its roots in some technological advance, and not in gimmicks thought up by harried marketing men.

He cites the drive-ins, super markets, vending machines, etc. We know that the invention and perfection of the automobile and our road systems are the technological advances that made these things possible. The invention of new packaging materials helped considerably. The marketing people then simply wrapped up these technical innovations into a new marketing scheme.

He doesn't realize that technical advances have also occurred in the gasoline area, but to a less spectacular extent.

The invention and perfection of



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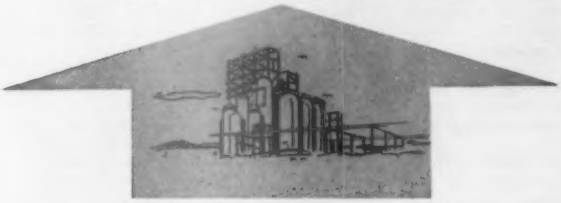

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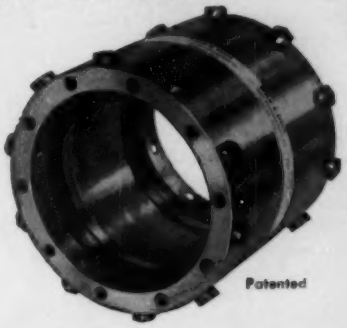

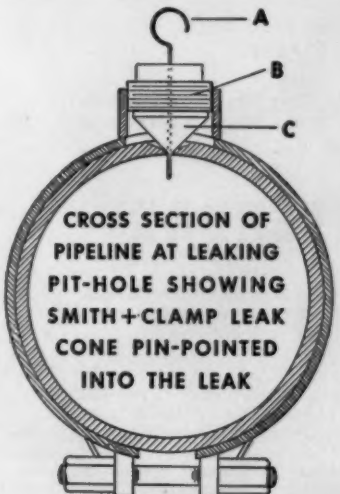

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such devices as the shut-off hose nozzle have increased the efficiency of service station operation by as much as 50% in our state. While this was invented a long time ago, it was necessary to improve the laws in order to apply it. As soon as the law was changed, the stations adopted this device.

Perhaps the only criticism he should make of the marketing people is that in the past they have not supported technological research and development in adequate fashion.

They have always tried to make advances through advertising and prettying up the stations rather than through solid, scientific and technical study.

The advent of the new API committee on oil-burner research under the marketing division may be indicative of a change of attitude.

I think the record is pretty clear that as soon as technological studies show something novel we can count on marketing people to bring it into play due to the fierce competition at that level.

E. C. Hughes
Manager,
Research Department
Standard Oil Co. (Ohio)
Cleveland

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

DECEMBER

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

13 Southern Gas Association, research and development roundtable conference, Paso del Norte Hotel, El Paso, Tex.

15-16 Oklahoma Independent Petroleum Association, annual meeting, Mayo Hotel, Tulsa.

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

19-20 API Committee on Public Affairs, Los Angeles regional conference on employe communications, Statler-Hilton Hotel, Los Angeles.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

20-21 Association of Oilwell Servicing Contractors, fifth annual convention, Dallas.

22-24 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

26-27 American Chemical Society, Southeastern Texas Section, fourth symposium on hydrocarbon chemistry, Shamrock Hilton Hotel, Houston.

30-Feb. 9 University of Illinois, annual quality control short course, Urbana, Ill.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

8-10 Southwestern Legal Foundation, twelfth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

9-10 API Committee on Public Affairs, New Orleans regional conference on employe communications, Roosevelt Hotel, New Orleans.

9-11 National Society of Professional Engineers, winter meeting, Hotel Fort Des Moines, Des Moines, Iowa.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Rice Hotel, Houston.

16 API Committee on Public Affairs, Dallas regional conference on employe communications, Sheraton-Dallas Hotel, Dallas.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

20-Mar. 11 Advanced Drilling Practices Course for Engineers, University of Oklahoma, Norman.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

28-Mar. 1 API Committee on Public Affairs, New York regional conference on employe communications, Park-Sheraton Hotel, New York City.

MARCH

1 Institution of Mechanical Engineers (Great Britain), symposium on user experience of large-scale industrial vacuum plant, London.

3 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus.

5-9 American Society of Mechanical Engineers, gas-turbine power division, and U. S. Department of Defense, annual gas-turbine conference and products show, Shoreham Hotel, Washington.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-9 API Committee on Public Affairs, Chicago regional conference on employe communications, Sheraton-Towers Hotel, Chicago.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

16-17 International Oil and Gas Educational Center, study of the economics of petroleum exploration, development, and property valuation, Southwestern Legal Center, Dallas.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

7-9 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southwestern Alaska Chapter, sixth annual mining, minerals, and petroleum conference, Anchorage, Alaska.

9-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

10-12 Western Petroleum Refiners Association, annual meeting, Granada Hotel, San Antonio, Tex.

11-13 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, annual conference, Moody Convention Center, Galveston, Tex.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

SEASON'S GREETINGS

From the Oil Bank of America to oil men around the world: Season's Greetings from all of us at NBT . . . and our sincerest wishes for your progress and prosperity throughout the year ahead. National Bank of Tulsa

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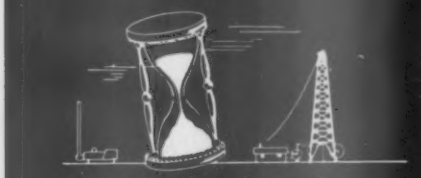


the Journal said...

50 years ago

December 22, 1910

C. H. Markham, president of Gulf Pipe Line Co., resigns to accept presidency of Illinois Central Railroad. George S. Davidson, of Pittsburgh, long associated with the Mellon interests, will succeed him as president of the pipeline company and other subsidiaries of Gulf's interests.

Cargo of 130,000 cases of petroleum unloaded from American ship at Chinnampo, Korea, opens direct trade between America and that country.

Wyoming Oil Producers Association formed at Cheyenne meeting with Gov. B. B. Brooks as president; E. H. Power, and Dr. Charles J. Fauwell as vice presidents; and 30 charter members.

25 years ago

December 19, 1935

Geologists predict daily oil production of more than 100,000 bbl. in Michigan within 2 years, and say 5 to 10 times as many fields as now produce remain to be discovered.

California oil production climbs above 700,000 bbl. daily for first time since 1930. Increase follows boost of 10 cents per barrel in crude prices, and new effort to stabilize present chaotic marketing conditions on Pacific Coast.

Drilling under Oklahoma's capitol building looms closer as British-American Oil Co. extends Oklahoma City field to within one block of capitol grounds with well (1 Piersol) flowing 9,000 bbl. of oil and 18,000 M.c.f. of gas daily from Wilcox sand at 6,342-62 ft.

10 years ago

December 21, 1950

Declaration by President Truman of national emergency opens way for increased governmental controls over oil industry. Newly formed Office of Defense Mobilization takes on characteristics of World War II setup.

Pacific Northwest Pipe Line Corp. plans 2,100-mile natural-gas pipeline from Texas Gulf Coast to Pacific Northwest. Proposed system to have capacity of 350,000 M.c.f. daily and cost $192,000,000.

Rotary drilling climbs to new all-time record high level with 2,521 rigs reported running in United States and western Canada. U. S. total of 2,407 active rigs is new peak number. Total exceeds previous week's number by 38 and year ago by 237.

JOURNALLY SPEAKING

Synergistic Oil

AFTER profound study we have discovered the basic trouble with the oil industry. It is suffering from synergism.

If you don't know what synergism is, that just shows that you don't know what's wrong with the oil business.

Synergism can be defined as a phenomenon whereby the total effect exceeds the sum of the individual effects.

Now an engineer, raised on Euclidian mathematics, would insist that there ain't no such animal. He would say that the whole can't possibly be greater than the sum of its parts.

But it can. The oil industry demonstrates it all the time.

Take refinery runs, for example. No individual refinery ever has excess runs. Each one turns out just barely enough products to fill the actual needs of its own customers. But the national total of refinery runs far exceeds the total demand for products practically all the time.

That's a phenomenon whereby the total effect exceeds the sum of the individual effects—in a word, a synergism.

Product stocks are synergistic, too. Every so often all the big oil companies in the country go down to Austin and tell the Texas Railroad Commission that their own stocks are almost exactly at the desirable level, but that the industry's total stocks are far above the desirable level.

This is an enigma which neither the companies nor the commission could explain, and it might have remained unexplained to this day had it not been for our brilliant discovery of this word synergism. (We discovered it while hunting for another word in the dictionary. We learn more darn things that way.)

Pursuing our research further, we learned that there is a theological definition of synergism: "The Semi-Pelagian doctrine that there is a cooperation of divine grace and human activity."

This fits the oil business, too. Without making the outright accusation that the oil industry is Semi-Pelagian, we can point out that oil men generally, and refiners particularly, appear to believe in this doctrine.

Refiners, for instance, exhibit implicit faith that d i v i n e grace will bring bitter cold in the winter and lovely motoring weather in the summer, and thus cooperate with their own human activity in turning out far more heating oil and gasoline than any mere mortal forecaster estimates is needed. Synergistic, see?

Of course there are grounds for faith in this doctrine of synergism. Divine grace has pulled the oil industry out of a hole more than once, and not just by c o o p e r a t i n g on the weather, either. Divine grace brought Henry Ford and automobile installment selling, which put a car in every garage and a filling station on every corner. It brought a World War, a Korean police action, and a closed Suez Canal to wipe out surpluses which the industry's human activity had piled up.

Lately, however, oil seems to have fallen from divine grace. A miracle is overdue. It is beginning to look as though the industry will have to get along without its Semi-Pelagian celestial cooperation and depend entirely on its own human activity to maintain an even keel.

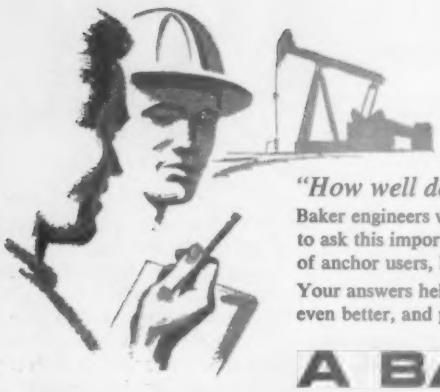
So if the theological aspect of synergism is extinct, the industry ought to devote some attention to that other aspect of synergism, the phenomenon whereby the total effect exceeds the sum of the individual effects. Such as refinery runs.

Incidentally, there is still a third definition of synergism, a medical definition. That is where two similar remedies combined increase the efficiency of either working alone.

Just as an offhand suggestion, it might be that the remedy of crude-oil proration combined with the remedy of adjusting refinery runs to match the level of actual consumption would p r o d u c e a synergistic effect that would bring more results than either one alone.

This synergism business is an intriguing thing.

—Henry D. Ralph



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Reduces Rod and Tubing Wear as evidenced by the need for fewer pulling jobs.

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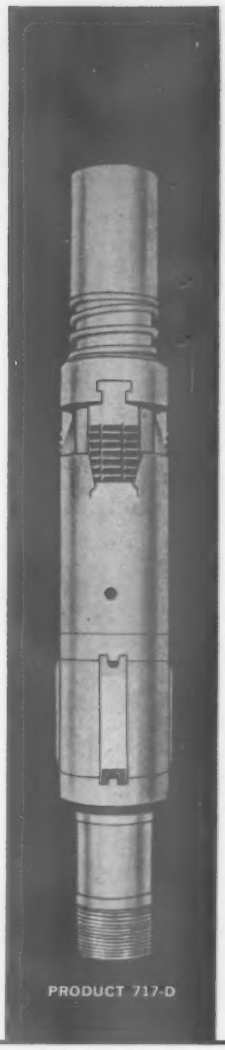
Really Does Compensate as indicated by the need to respace pumps after several days use, or by the upstrain required to release doughnut-type hangers—or, most importantly, by the results obtained.



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Because it automatically compensates for changing well conditions, it maintains the right amount of tension at all times to effectively eliminate breathing and buckling. It's easy to run—no involved calculations, no need to apply tension from the surface.

A careful study of hundreds of field reports reveals not one reported instance of inability to retrieve a Baker Compensating Anchor where the casing above the anchor was in good condition and to gauge. And recent design improvements now insure easier removal with greater freedom from corrosion.

The economics of today's oil industry make it more important than ever to explore every possible means of cutting costs and improving efficiency. Baker honestly believes that the Compensating Tubing Anchor is one such means. Your Baker Man has the facts on this tool's past performance, and on the several ways it has been improved. Ask him.

TYPICAL FIELD REPORTS

Kansas: Operator ran anchor in an attempt to cut down tubing leaks (seven leaks in previous three months). In the twelve-month period following installation of a Baker Compensating Tubing Anchor he has had only two tubing leaks and has increased pump efficiency by approximately 43%.

Texas: Operator had run twenty-five Baker Compensating Tubing Anchors and was very pleased with results. As a test, he released the Baker anchor in a well that was making 140 barrels per day. After release (tubing string unanchored) he reported that production fell off to 75 barrels per day. After resetting anchor, production went back to 140 barrels per day.

Eastern Colorado: Operator has run 40 Baker Compensating Anchors. Had not previously used anchors. Ran anchors to reduce frequency of tubing jobs to replace rod-cut tubing. Reported that he had eliminated rod-cut tubing, increased pump life 100% and production 14%.

BAKER

BAKER

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How to squelch talk of end-use control

FOR A LONG TIME the oil and gas industry has been worried over the threat of a thing called end-use control.

This is a gimmick dreamed up by the coal industry to get the Government, on one pretext or another, to decree that coal should have no competition from oil or gas in certain markets.

Coal's current maneuver is to try to sneak its gimmick into a proposed congressional study of national fuels policy. So oil and gas have been opposing a study of fuels policy.

THERE'S NO GOOD REASON why oil and gas should fear such an outlandish idea as end-use control which can easily be shown up as a complete phony that the American people wouldn't tolerate.

So why not have a public airing of the subject, get the facts on the table, and bury this bogeyman once and for all?

There is nothing to fear in a study of national fuels policy—except the fear that the coal lobby may someway pervert and poison the minds of those making it.

So the obvious tactic is for oil and gas to take the offensive and meet this challenge head on. Support a policy study, demand that it be objective and unrigged, and then aggressively participate in it.

In such a forum oil and gas can expose coal's subversive tactics in trying to weasel end-use control into the actions of various governmental agencies in violation of national policy and show how for years coal has deviously attempted to thwart open competition and consumer choice of fuels.

Coal says we have no national fuels policy. That's wrong. We do have one. But it's one coal doesn't like because it permits change and choice and competition. This should be explained and extolled.

A quickie study should do the trick, and oil and gas can help speed the process. There have been many fuels-policy studies in the past, and with rather consistent findings. They just need to be dusted off and reaffirmed —with this end-use-control nonsense sat on hard.

POSITIVE BENEFITS, in addition to the negative one of scotching coal's Trojan horse, could be reaped by the oil and gas industry through taking the lead on a fuels study.

It could demonstrate that there is no danger of a fuels shortage so long as industry has incentives to grow, that competition is the best guarantee of reasonable prices, and that no federal supervision is called for.

It could justify state control of conservation, the tax treatment of mineral depletion, and limitations on imports of oil. It could build the policy groundwork for workable natural-gas legislation.

And the oil industry's morale would be boosted by seeing its leaders for once taking the aggressive in Washington instead of always being on the defensive and shuddering at something that might be under the bed.

How "K" Monel alloy has revolutionized directional drilling

In 1920, a half-filled bottle of acid was used to measure the verticality of a hole. Lowered into the hole and left there for a few minutes, the acid etched a line around the inside of the bottle. This gave an approximate indication of the deviation from vertical.

Today, the use of "K" Monel* alloy drill collars allows faster and more accurate determinations. The reasons are simple. By using a *permanently non-magnetic* "K" Monel collar, a wire-lined or go-deviled survey instrument can be spotted well below the magnetic field of the string in automatic alignment with the hole. And the operator retrieves or leaves it, as desired. No need to pull the string.

"K" Monel alloy is immune to stress-corrosion cracking so common to many ferrous alloys in the presence of the chlorides and hydrogen sulfides in oil well water.

Because of its good wear resistance and high strength (140,000 psi minimum tensile), "K" Monel alloy withstands the extreme stresses next to the drill bit and the abrasive conditions of drilling. Its permeability is 1.01 maximum. Its Curie point is −150°F.

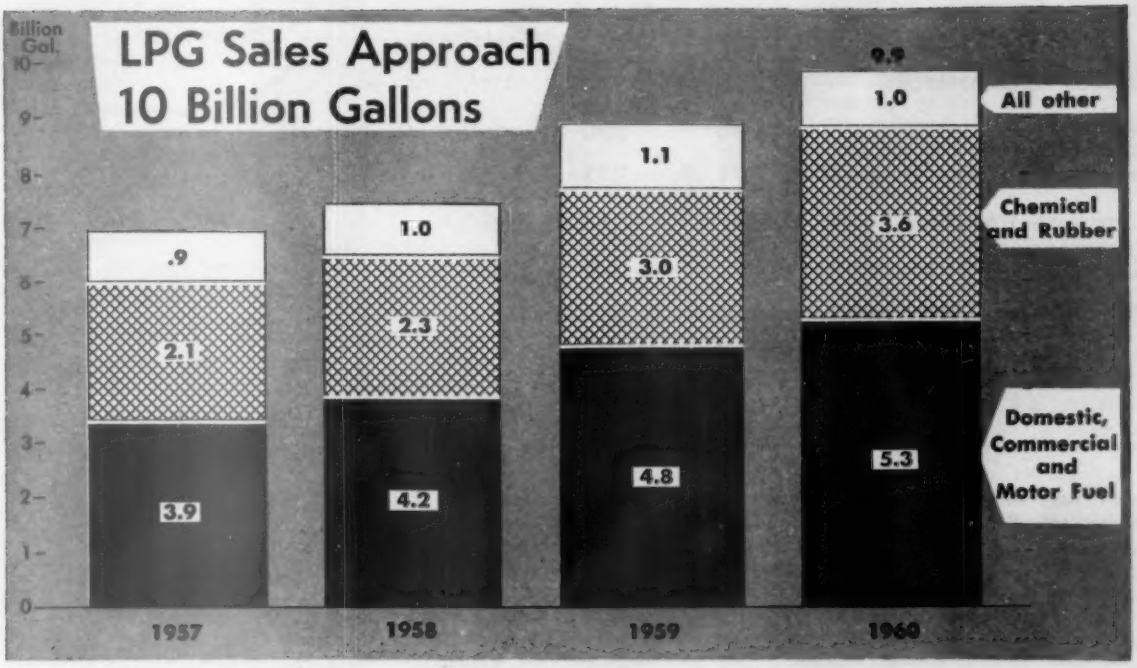
"K" Monel alloy will not become magnetic from cold working by dropping or rough handling. For practical information on how high-nickel alloys have solved many production problems write for our booklet, "Metals to Make Petroleum Production Equipment Produce More."

*Registered trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia

Drill pipe used by Shoreline Exploration Co. in a deep survey. "K" Monel alloy collar provides accuracy needed to hit desired 800-foot off-set target across a fault at 14,000-foot level. Contractor: J. C. Trahan Drilling Contracting Company. "K" Monel alloy collar supplied by Bob Croom, Inc. of Lafayette, Louisiana.

"K" MONEL®



Demand for LPG Shoots to New High

• Liquefied gases are having their best year in nearly all markets. Total sales are up 10.5%. The fastest growing market is in petrochemicals.

THE LPG industry is enjoying another record year in 1960 with sales estimated at 9.86 billion gallons, a 10.5% increase over last year.

Petrochemical markets again are the fastest growing outlet for the liquefied gases but nearly all markets continue to gain, according to a year-end review of the industry made by W. F. DeVoe, A. F. Dyer, and George R. Benz of Phillips Petroleum Co.

Chemical manufacturing consumed an estimated 3.03 billion gallons for an annual increase of 20%. And this does not include LPG used in making synthetic rubber which increased 7% to 550 million gallons.

The performance of other LPG markets:

... **Domestic and commercial sales** 4.328 billion gallons, up 10%.

... **Motor fuel** 943 million gallons, up 6%.

... **Industrial and miscellaneous** 871 million gallons, about the same as last year.

... **Gas manufacturing** 137 million gallons, a decline of about 25%.

Production in 1960 kept pace with increased demand through new plants, expansion of old plants, and improved recovery. Thirty-nine new gasoline plants and nine plant-expansion programs were completed in the United States during the year, adding 3.2 million gallons to the daily production capacity of the industry.

Underground storage capacity was increased. Advances in LPG transportation to move higher volumes included larger capacity highway transports, larger rail tank cars, and new pipelines devoted exclusively to LPG.

The major market . . . Largest outlet for LPG is still sales to domestic and commercial customers.

The 10% increase in this category resulted from use of gas for home heating, cooking, water heating, and other domestic uses, plus various agricultural uses.

Most important factor in domestic growth continues to be home heating "beyond the mains," where weather is the greatest influence on volume. The trend to increased use of LPG for home heating is expected to continue as tank-leasing programs, more efficient transportation, and similar factors make LPG more competitive with other fuels.

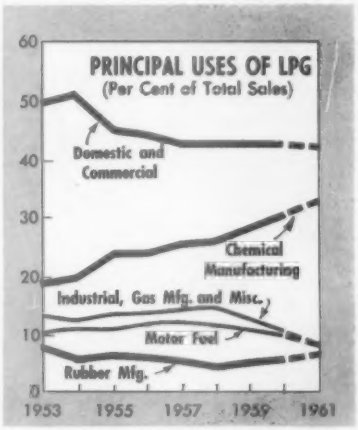
Farmers, besides using LPG as a

Trends in LPG Sales

The Volumes Are Up . . .

	Volume (Million gallons) 1960	1959	Percentage gain
Domestic, commercial	4,328	3,935	10.0
Motor fuel	943	890	6.0
Industrial, miscellaneous	871	871	. . .
Gas manufacturing	137	183	—25.0
Chemical manufacturing	3,031	2,526	20.0
Rubber manufacturing	550	514	7.0
Total	9,860	8,919	10.5

Markets Are Changing



motor fuel, are employing it for crop drying and flame cultivation. LPG continues to be used extensively for tobacco curing and many other farm jobs.

The survey reported that LPG appliance sales dropped off in 1960. The appliances include cooking ranges, water heaters, furnaces, wall heaters, incinerators, and air conditioners. Although sales of these appliances declined, the number in domestic use still was sufficient to be a factor in increasing LPG sales.

Chemical markets . . . One noticeable trend in this area is that less butane is available for the LPG market except at premium prices.

Analysts noticed in 1959 that propane was preferred to butane as a chemical feedstock due to its lower cost per gallon. This preference accelerated in 1960 because refinery and synthetic rubber demands for butanes and butylenes increased as new alkylation units and rubber plants came on stream.

Another trend in 1960: Ethane increased more rapidly as a chemical feedstock than propane, and this is expected to continue. About one-third of the total volume of LPG sold for chemical manufacturing consisted of ethane and ethylene.

Demand for ethylene to meet growing needs of polyethylene, ethylene oxide, and ethyl alcohol resulted in plant expansions. The same is true of facilities for propylene recovery. In all, about 120 new petrochemical projects are planned or under way this year, compared with only 47 such projects only 2 years ago.

The 7% increase of LPG going into rubber manufacture would probably have been twice that had automobile sales come up to expectations. The greater number of compact cars which require less rubber per car also was a limiting factor for normal butane, butylenes, and some ethylene feedstocks. These factors were offset some by an increase in the export demand for rubber.

Other markets . . . Use of LPG as a motor fuel continues to increase at a moderate pace.

Interest in motor-fuel usage remains high with emphasis primarily on industrial trucks, farm tractors, irrigation engines, and other stationary engines. Excessive moisture in parts of the country hurt demand in irrigation areas and on the farm tractor market.

Industrial usage of LPG declined in 1960 due to the inroads of natural gas, but there is evidence this may change next year. Many industries are considering use of stand-by LPG plants to take advantage of the relatively low rates offered by utilities on interruptible natural-gas service.

Industrial usage was helped from another source: Asphalt plants supplying material for the increased federal highway program. Other increases came from use of LPG in secondary recovery projects and as a propellant in pressurized product containers.

Outlook . . . The LPG industry has made gains practically each year in the last 35, but the Phillips survey team reported its markets are far from saturated.

The growth rate may well level off some, the report noted, but there is no indication of any rapid decline.

Many LPG firms are still expanding their operations by providing better coverage of their territory. Some small distributors will continue to merge with or sell to larger companies because capital requirements are growing. This means that more large, publicly financed distributors will appear.

As competition becomes more keen, more and more emphasis will be placed on operational efficiency and improved management techniques.

One of the year's biggest developments involves new pipelines devoted entirely to moving LPG.

The Mid-America Pipe Line extends from Eunice, N. M., to Minneapolis and Madison. It is 2,200 miles long with a capacity of 50,000 bbl. daily. Nine terminals are located at strategic points.

Two other lines also are being talked from the Houston area to the southeastern section of the country.

The pipelines are expected to have a distinct effect on distribution and marketing in the regions they touch.

New Frontiers Opened to Computers

• Scientific breakthrough gives mechanical brains an amazing "thin-film" memory that assures faster data-handling at lower cost. This and other new developments bring nearer the time when a machine will program itself.

THE third computer generation has arrived as a result of a scientific breakthrough which not only greatly speeds machine data handling but also reduces its cost.

We are also a step closer to the computer which will program itself.

This buoyant announcement was made last week by the Remington Rand Univac Division of Sperry Rand Corp., which disclosed five "dramatic" new data-processing advances:

...Thin film computer memory, described as the most advanced and fastest form of memory yet developed, whose speed is rated in terms of billionths of a second rather than millionths. This is the breakthrough that ushers in the so-called new generation.

...The first of the third-generation computers, the Univac 1107, the first thin-film memory computer. It ranks with the fastest super-scale computer systems ever developed and is appreciably lower in cost than less advanced equipment, the developers state. Delivery will take 18 months to 2 years from order date.

...A communications-computer network system, the Univac 490 real-time system, which provides instantaneous inventory and production-control data for the first time to companies with widely scattered plants, offices, and warehouses.

...A military version of the real-time system.

...The first international language for programing business problems by means of the common business oriented language (COBOL) automatic-compiler systems for use with computers. These compilers permit the programing of computers in the English language, "the most dynamic advance since the advent of automatic coding for computers."

Thin-film memory . . . The significance of this achievement was hailed by D. L. Bibby, president of Remington Rand, as making possible a whole new generation of computers that operate in billionths of a second.

It will result in commercial computers, the company said, with much greater capabilities at considerably lower costs for manufacture, operation, and maintenance.

Thin-film computer memory was perfected after 7 years of research seeking a small-size, rapid-access internal memory. The material is a ferro-magnetic film, a few millionths of an inch thick, made by depositing vapors of iron, nickel, cobalt, or other ferro-magnetic metals or alloys on thin-glass plate.

Deposition can be made in such a manner as to permit the magnetic state to be switched in as little as a billionth of a second. The speed at which information can be stored or retrieved is related directly to this switching speed. Thin magnetic-film memories may ultimately permit a thousandfold increase in computer-memory speed, Remington Rand said.

It is the type of memory that can be interrogated and read out millions of times without destruction. It requires less electric power for energizing than do other memories.

Since ferro-magnetic film elements can be produced in extremely small size and with fast switching speeds, they make possible smaller computers of greater capability.

Such computers should be more reliable, because of film durability. Since film lends itself to automatic production, computers should be produced more economically.

Moving in the future, the company speaks of possibilities that can only be described as breathtaking.

"When thin magnetic film begins to be used for performing logic as well as memory functions," the company said, "computers will have even greater capabilities and will be well on their way to self-adaptive functions, i.e., organizing themselves to a job in the best possible way, and even to program themselves."

Thin-film computer . . . The 1107 is a solid-state data-processing system, the first to use thin film, and is designed to solve complex problems off line and "real time" problems on line.

The cycle time, or time required to read and write information, is only 0.6 microseconds (millionths of a second). This compares with a cycle time of the fastest previous memory design of 1.5 microseconds.

Remington Rand said the 1107 is 1½ to 2 times faster and has twice as much core storage as any existing computer in this price class.

Rental ranges from $40,000 to $60,000 per month, depending on configuration. Typical configuration would occupy 150 sq. ft., not including passageways and work areas.

Applications of the 1107 include data reduction and analyses, scientific computation, digital communications and switching systems, simulation, logistics and intelligence systems, traffic control, and inventory and scheduling. The computer can accommodate a wide variety of auxiliary equipment and can communicate with many types of data-processing devices.

Real-time system . . . Prior to this system, electronic computers were "historic," with a time interval between feeding in data and obtaining results.

The 490 is said to be the first data-processing and communications system supplying facts and results virtually without time loss. The central computer instantaneously solves problems sent to it from widely scattered locations and delivers answers fast enough to control the operations containing the problems.

Calco Testing Off Florida

THE California Co. has plugged and abandoned a Gulf of Mexico test off southern Florida, but has moved its rig northward for another try near Carrabelle.

The S-45 rig went to 13,500 ft. before quitting at the 1 State Lease 224-B, in the Boca Grande area ff Lee County and Fort Myers. The company found "nothing promising at all."

The new test, in State Lease 224-A, was spudded in 24 ft. of water about 18 miles east of Carrabelle off northern Florida. Projected depth is 10,500 ft. Calco drilled a dry hole about a year ago in the same area.

The Calco wells are located on leases of Coastal Caribbean Co. Calco is earning an interest in the leases with the drilling program. No commercial oil has ever been found in offshore Florida.

SUNRAY CIRCLE at 51st and Yale in southeast Tulsa features a new approach to service-station design, layout, lighting, equipment, and personnel for marketing in a suburban area of middle-class homes where women do much of the gas shopping.

Eye-Catcher DX Service Station Aims at Being

A NEW circular service station, loaded with enough revolutionary facilities and equipment to attract any customer, was unveiled last week in Tulsa by DX Sunray Oil Co.

Besides the unusual circular design, the station sports a customer TV lounge, a full-time driveway hostess, self-sufficient islands that have built-in vacuum cleaners and pumps with gold-plated nozzles, and kitchen-neat wash and lube bays.

S. D. Breitweiser, president of DX Sunray, explained the station was tailored to fit customer needs after months of research by company marketing employes and equipment makers.

"In the past," he said, "the oil industry has been guilty of shrugging its shoulders at the customers and saying in effect, 'take it or leave it.' Little has been done at the service stations across the country to give the customer what he really wants. This station is a major step in what we believe to be the right direction."

The station also represents the first phase of a three-stage development program for DX Sunray's marketing operations. Subsequent developments are planned for dealers and for highway marketing.

The design . . . Three basic aims guided DX Sunray management in arriving at the new station design.

Company planners decided the station must be functional, efficient, and appealing. Their over-all aim: A highly attractive center where employes could serve customers faster and better.

Likes and dislikes of women motorists figured in the planning.

A site was chosen in a growing, middle-class suburban area near the access to a heavily traveled bypass, commercial zones, and new residences.

The result:

. . . **A building circular in design,** built of shadowall concrete blocks, structural steel, and polished plate glass. The circular roof hangs from a center column in the service area and is supported by steel columns on the perimeter. The roof is divided into 14 segments which rise from 10-ft. elevations in front and rear to 14 ft. on each side over the service bays.

. . . **A sales room** of elliptical shape, allowing the operator to see all four pump islands from his desk.

The room contains a sofa, coffee

LUBE BAYS and two wash bays, one of which can double as a tune-up bay, are almost concealed in the back segment of the circle. Inside, all tools and supplies have a specific place.

ISLAND PARADISE has almost everything handy—gas, air, water, vacuum-cleaner attachment, oil, battery and windshield service, and credit-card imprinter.

a Money-Catcher, Too

table, television set, and magazine rack, walnut-paneled showcase, and display racks for products.

. . . A service area in the back segment of the circle containing twin lube bays with two wash bays opposite.

Overhead between the lube bays is a bank of eight reels for dispensing two grades of motor oils, two chassis lubricants, automatic transmission fluid, water, air, and gear grease.

In the wash bays, overhead reels dispense water, motor-cleaning solvent and water-detergent. The reels are supplied from tanks in the mechanical equipment room. They save space and keep housekeeping to a minimum.

Space also is provided in the service area for motor tune-up, overhead tire storage, racks for hand tools, and rooms for product storage.

. . . Pump islands on the driveways which are complete sales areas in themselves.

The integrated unit eliminates waste handling and saves on manpower. The two hoses on each island are white with gold-plated nozzles and swivels. A magnetized section of a nozzle holds the customer's gas cap while the car is being filled with gasoline.

. . . A pleasing general appearance, enhanced by paving which nearly circles the station, landscaping which features a decorative cement-block fence in back, and lighting of the entire area.

Sales techniques . . . The new station will be backed up by a strong selling program.

A driveway hostess will be on hand to greet women customers and see that their motoring needs are filled. She will also keep the customer-reminder files and contact customers when it's time for their cars to get regular servicing again.

Two of the driveway salesmen will fan out over the area near the station, ringing door bells and soliciting new customers.

In addition, the entire station crew will serve as a sales force. Each member attended a 4-week school where he was trained in the latest service and selling techniques with emphasis on one theme: Please the customer. That's also the theme that prompted DX Sunray to offer the public a new concept in station design.

Sea Bag for Fuel

. . . storage is called a success after test.

THE U. S. Navy's initial experiment in storing fuel in a rubber bag on the ocean bottom has been a success, according to the company that designed and built the bag.

U. S. Rubber Co. inspected the flexible storage tank in Houston last week and reported that 5 months of submersion had left it intact. The only break occurred about 30 days after installation—and it may have been caused by damage during handling. An underwater mechanical patch repaired the damage.

What happens next is up to the Navy. In the talking stage is a project to tie 10 2,500-bbl. bags to a central tank and store 25,000 bbl. of fuel offshore for naval vessels.

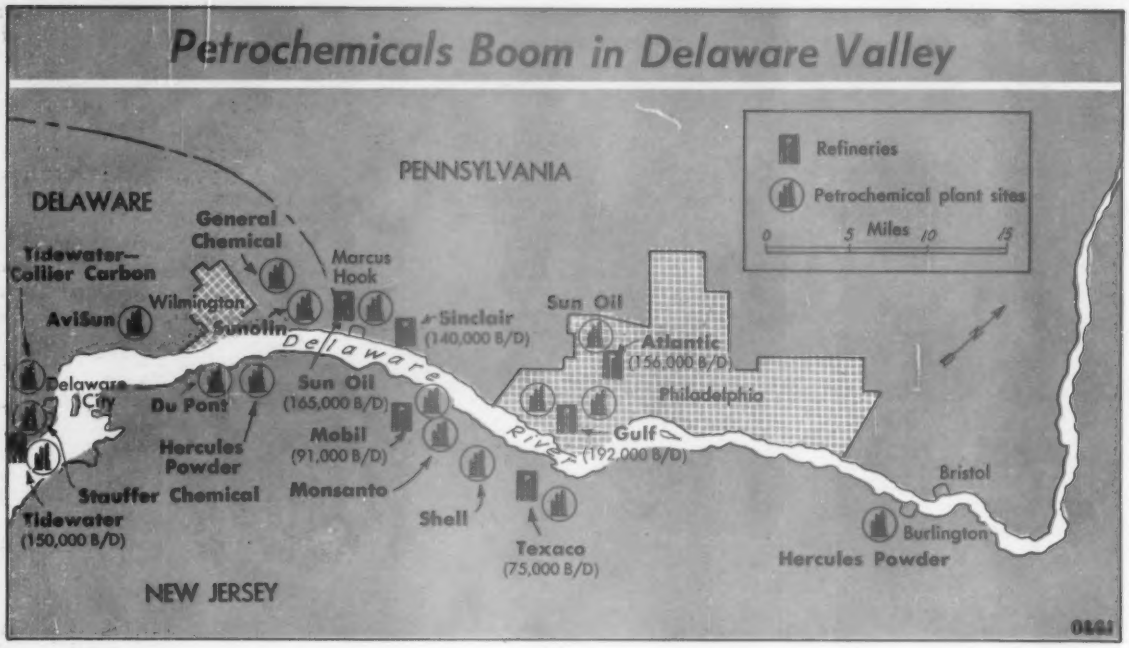
The first experiment was conducted with a 1,200-bbl. (50,000 gal.) bag in Block 37, Grand Isle area, in offshore Louisiana (OGJ, June 6, p. 75).

Diesel fuel was pumped into the bag but was not used, as originally planned, by vessels in the area. However, the fuel was pumped in and out twice for testing purposes.

The bag was held in place on the ocean floor, 50 feet down, by a nylon webbing attached to a pile-driven frame. When it was raised last week, workmen severed the pilings below the jacket and lifted the frame and empty bag aboard a barge.

Later the bag will be sent to the Navy's engineering and supply depot at Bayonne, N. J., for inspection. It is made of nylon fabric impregnated with synthetic rubber.

C. B. Rodenbach, design engineer for U. S. Rubber, said the company believes the experiment has proved that storage of liquids in flexible tanks under water is feasible and practical.



Big Petrochemical Center Takes Shape

• Along the Delaware River south of Philadelphia, six major petrochemical plants are in the works. If growth keeps up, the area—already the second biggest refining center in the nation—may rank among top petrochem sites.

D. H. Stormont
Refining Editor

A BIG new petrochemical center is in the making along the Delaware River near Philadelphia.

Within the past year a half-dozen plants have been started or announced for the area, which is second only to Houston as a refining center. Since one plant tends to attract others, this part of the Delaware Valley also may become one of the largest petrochem-producing complexes.

Philadelphia-based Sun Oil Co. leads the entry march, chiefly through new companies linked with established chemical concerns. Other oil companies with refineries in the valley have joined the parade in varying degrees.

Compared with the Houston ship-channel area, the Delaware Valley petrochemical industry is little more than an infant. So far, only about $175 million has been invested in plants producing basic and intermediate petrochemicals. But judging from the current rate of growth, this investment will be more than doubled within the next 3 years.

The 30-mile region extending from Philadelphia to Wilmington, Del., offers several lures for new chemical plants. Attractions include:

... **Plentiful raw materials.** Seven large refineries (with a combined capacity of almost 1,000,000 bbl. daily) assure a good supply of refinery gas. Natural gas is also readily available.

... **Abundant fresh water.** The Delaware, with a mean-average flow of 15,700 cu. ft. per second, assures plenty of process water.

... **Large labor pool.** The highly industrialized area has a good record of labor relations. And as a spokesman for one chemical firm expressed it, the refineries offer a ready source of experienced operators and skilled craftsmen.

... **Proximity to markets.** About one-third of the U. S. population lives within 300 miles of Philadelphia. Within the greater Philadelphia area alone, more than 700 plants either produce or consume petrochemicals.

... **Excellent facilities.** The 40-ft. dredged channel allows all but the biggest ocean-going vessels to navigate the Delaware as far north as Trenton. A large network of railroads and expressways streamlines overland shipping.

Availability of plant sites in the area is still another enticement for oil and chemical companies. Little waterfront acreage is available on the Philadelphia side, but large tracts on the New Jersey side are undeveloped.

Sunolin Chemical Co. in seeking to draw other chemical plants into the area, points out that 6,600 acres are available for plant sites across the river from its Claymont plant. Farther down the river, land is available on both sides. Tidewater Oil Co., for example, has a 5,000-acre tract around its Delaware City refinery.

The eastward trend . . . The desire to locate new plants closer to major markets is the principal reason oil and chemical companies are considering the East Coast.

Current price erosion, excessive producing capacity in almost all lines of petrochemicals, and growth of the European petrochemical industry might be expected to deter this trend. But this is not the case. More competitive conditions are spurring the companies to look for sites where they can have a price edge on their rivals.

The Gulf Coast, with its plentiful

supplies of refinery raw materials and cheap gas, will continue to attract the bulk of new petrochemical plants for some time. But where shipping costs account for a substantial part of the East Coast delivered price, or where exchange arrangements permit shipping costs to be cut, a price advantage may be realized by building eastern plants.

Industry experts say most of the plants to be built in the Delaware Valley and on the East Coast will be those associated with the plastics and resins industries. They figure the situation particularly favors enterprises based on propylene, while plants keyed to vinyls and styrene also have a good chance.

With only limited amounts of propylene available on the East Coast, suppliers have tended to quote prices much higher than those on the Gulf Coast. According to one supplier, the current East Coast refinery price is about 5½ cents per lb. as compared to 3 cents on the Gulf Coast.

Large-scale production of propylene in a Delaware Valley plant may shave the price to about 3½ cents per pound. With shipping costs to the East Coast running about ½ cent per pound, the East Coast-produced chemical thus would be competitive.

Fuel costs . . . Compared with the low price of natural gas on the Gulf Coast, the commercial rate to large users in the Delaware Valley is about 40 cents per M.c.f. This high price almost prohibits the use of gas for fuel, but the picture on gas as a charge stock is much more favorable.

In figuring the value of their refinery gases, East Coast refiners generally relate them to fuel oil on a B.t.u. basis. Since fuel oil supplies most of these refiners' heat and power, East Coast fuel costs thus have been more stable than those of Gulf refineries. Based on 1956 data, wellhead natural-gas prices have increased about 300% while the East Coast fuel oil-coal price has increased 154%.

Who's building . . . Sun was one of the first Delaware Valley refiners to recognize that additional income could be realized from processing refinery streams into basic and intermediate petrochemicals.

It also saw the marketing benefits obtainable through connections with established chemical manufacturers. With American Viscose Corp., Sun formed AviSun Corp. to produce polypropylene. Besides a plant in the New York area, AviSun now is building a 100-million-lb.-per-year polypropylene plant at New Castle, Del.

Sunolin Chemical, jointly owned by Sun and Olin Mathieson Chemical Corp., is building a $20,000,000 ethylene plant at Claymont, just across the Delaware line from Sun's Marcus Hook, Pa., refinery. Using refinery gas as a feed stock, the plant will have a capacity for producing 225,000,000 lb. per year of ethylene and 55,000,000 lb. of ethylene oxide.

At its Philadelphia refinery, Gulf Oil Corp. is completing a $10 million plant capable of producing some 40,000,000 lb. of oxo-alcohols annually. This will be the area's first basic plant to use iso-alcohols as feed stocks. It is expected that Gulf will add other facilities for producing oxo derivatives.

Two other plants recently completed are Texaco's cumene plant at its Westville, N. J., refinery, and Stauffer Chemical Co.'s carbon-disulfide plant next to Tidewater's Delaware City refinery.

Three other plants will soon be started. At Delaware City, Tidewater and Collier Carbon & Chemical Co. will jointly build a 100,000,000-lb.-per-year naphthalene plant. Near Paulsboro, N. J., Monsanto Chemical Co. will erect a phthalic-anhydride plant and a 20,000,000-lb. benzyl-chloride plant. Shell Chemical will build a 20,000,000-lb. polypropylene plant at Woodbury, N. J. It also has another New Jersey plant site north of Camden.

A Box Score on the Delaware Valley's Refineries and Petrochemical Plants

Refineries in Operation	Capacity, B/D
Atlantic Refining Co., Philadelphia	156,000
Gulf Oil Corp., Philadelphia	192,000
Sinclair Refining Co., Marcus Hook, Pa.	140,000
Mobil Oil Co., Paulsboro, N. J.	91,000
Sun Oil Co., Marcus Hook	165,000
Texaco Inc., Westville, N. J.	75,000
Tidewater Oil Co., Delaware City	150,000

Petrochemical plants (Built, building, and announced)	Type of Production
AviSun Corp., New Castle, Del.	New 100,000,000-lb.-per-year polypropylene plant.
Atlantic Refining Co., Philadelphia	Detergent alkylates, diisobutylene, ammonia.
Du Pont de Nemours & Co., Gibbstown, N. J.	Anhydrous ammonia.
General Chemical Co., Claymont, Del.	Sulfuric acid.
Gulf Oil Corp., Philadelphia	New 40,000,000-lb.-per-year oxo-alcohol plant.
Hercules Powder Co., Burlington, N. J.	Dimethylterephthalate.
Hercules Powder Co., Gibbstown	Phenol, acetone, cumene.
Mobil Oil Co., Paulsboro	Sodium cresylate, propylene, sulfur.
Monsanto Chemical Co., near Paulsboro	New 20,000,000-lb.-per-year benzyl chloride plant.
Shell Chemical Co., Woodbury, N. J.	New 20,000,000-lb.-per-year polypropylene plant.
Sinclair Petrochemicals, Inc., Marcus Hook	Toluene, paraxylene and orthoxylene.
Stauffer Chemical Co., Delaware City	New carbon disulfide plant.
Sun Oil Co., Philadelphia	Propylene, aromatics, urea, sulfonates, naphthenic acids.
Sunolin Chemical Co., Claymont	New 225,000,000-lb.-per-year ethylene and ethylene oxide plant.
Texaco, Westville	New 60,000,000-lb.-per-year cumene plant.
Tidewater-Collier Carbon, Delaware City	New 100,000,000-lb.-per-year naphthalene plant.
Tidewater Oil Co., Delaware City	Mixed aromatics.

Angles, Tangles in State Taxes Irk Oil Men

• Complaints are against the slipshod methods used by some states in making tax audits, unfair "extra" taxes on suppliers, and the dizzy structure of state taxation in general. Protests may bring drive for corrective action.

OIL-EQUIPMENT suppliers and the oil companies they serve are becoming increasingly annoyed these days at the maze of regulations and interpretations of state sales and use tax statutes.

Their complaints center around two problems:

...**Tax audits** by some states are inefficient, wasteful, and expensive.

...**Tax levies** themselves are inequitable, placing an unfair burden on doing business in some states.

Hopping mad . . . Some suppliers are in a fighting mood at the failure of many states to place their tax enforcement on a consistent basis.

The equipment companies feel that regular audits and better communication of tax-law changes would be fairer to the taxpayer and would increase revenues to the state.

In too many instances now, the state tax authorities make a check of the suppliers' books from 4 to 5 years after the sale. Their audit seeks to determine if the supplier collected the tax from the buyer and in turn paid it to the state.

Equipment companies have the option usually of sending their books and records to the state taxing agencies for the check or of paying the expense of auditors to visit their offices.

The supplier usually elects to have the auditor visit the home office because this is less disruptive to his business. The company is called on to pay the auditor's expenses, and this creates a real irritation.

One supplier cites this example. A tax auditor this year spent several days in the company's office checking records for the last 4 years. His expenses totaled $700. The amount of unpaid tax uncovered was only about $230.

The supplier had to pay the taxes himself because some of the customers who bought the equipment had gone out of business, and it couldn't be passed on.

In Illinois recently a state auditor discovered a $12,000 additional tax item he claimed was due the state. A conflict in rulings between a state tax court and the state supreme court had created the confusion. The supplier went back to the buyers and collected $10,500 of the tax but had to dig into his own pocket for $1,500. And that's the story of too many of the delayed tax claims—they're very difficult to collect from the customers.

The suppliers claim that regular audits announced well in advance would help companies maintain easily accessible records and keep tax liabilities current. Some states have no statute of limitations on taxes which makes companies liable for back taxes indefinitely.

Some of the unrealistic expense accounts submitted by the state auditors also don't help matters. These have on occasion included golf green fees, temporary club passes and memberships, and "requested entertainment," under varying labels.

Confusion . . . The real problem plaguing oil men, however, is the confusing labyrinth of taxes in various states.

They especially complain against:

...**Double taxation.** An oil company, for instance, buys pipe in Louisiana and trucks it into Arkansas. The buyer pays a 2% sales tax in Louisiana and a 3% use tax in Arkansas on the same batch of equipment. This prompts buyers to switch supplier loyalty and where possible to buy in the state where equipment will be used.

...**Taxing offshore equipment** used in the Gulf and beyond the continental limits of the United States. This has led to roundabout shipments from suppliers in other states to take advantage of tax exemptions for interstate commerce shipments.

...**Unequal enforcement.** The differences in methods the various states take in collecting taxes and enforcing tax laws is an upsetting factor. It has caused some inland customers to junk suppliers who have served them for years and shop next door across a state line to gain a worthwhile tax advantage.

...**So many taxes.** Besides the many different state taxes, cities and counties in many states also have levies that must be collected by suppliers.

Thirty-eight states levy sales taxes on retail sale of tangible personal property, and 35 of these also levy a use tax on material brought into their boundaries. Most states allow the companies from 2 to 5% rebates on the taxes for the expense of collecting them from the purchaser. Kansas and New Mexico, both oil states, however, give no such credits.

Adding to the confusion is this: Nearly all counties in Illinois and 11 counties in Utah also levy a sales tax. Some cities and parishes in Louisiana have the sales tax.

These levies add up to a respectable sum. In the first 9 months of this year oil equipment sales in the U. S. were reported at $560 million, and $17 million was paid out in sales and use taxes.

The way out . . . The resentment against the tax confusion and inequality is growing.

At least one major supplier in recent weeks has advised a state tax unit it will not pay the expenses of an auditor to perform the tax audit.

The supplier noted that it had no sales outlet in the state and advised that the state's auditor would be welcome at its headquarters city but none of his expenses would be paid.

The Petroleum Equipment Suppliers Association is fully aware of the

PROCESSING

A polystyrene plant with a capacity of 25,000,000 lb. yearly will be built near Chicago by the chemical division of Rexall Drug & Chemical Co. Completion is slated for late 1961 and will raise Rexall's polystyrene capacity to 70,000,000 lb. yearly. The company has other polystyrene plants at Holyoke, Mass., and Santa Ana, Calif. Styrene feed stocks for the new plant will be supplied by El Paso Natural Gas Co.

Work is under way on the multimillion-dollar West Whitecourt gas plant in the Windfall field 25 miles northwest of Whitecourt, Alberta. Pan American Petroleum will operate the plant to process gas reserves from the Windfall, Pine Creek, and Beaver Creek fields. Processed gas will be sold to Alberta & Southern Gas Co., Ltd., for delivery to Pacific Gas &

problems. Its statistical committee is building a sizable file of "illogical enforcement" cases.

The big hope is that out of this resentment eventually may come a move to simplify the maze of taxes and collection procedures.

Ohio Oil Buys Marketer

A PROPOSED exchange of common stock would give Ohio Oil Co. all the stock of Ross Oil Corp., one of the biggest gasoline and fuel-oil jobber organizations in Ohio.

Officials of both companies said last week an agreement on the deal had been reached between Ross Oil stockholders and Ohio Oil.

The shares exchange will give Ohio Oil a subsidiary with an established marketing organization in the metropolitan Akron area for the first time. Amount of stock involved in the transaction was not disclosed.

Ross Oil distributes through 87 service stations and an 800,000-gal. bulk plant at Akron. Some two-thirds of the service stations are in the greater Akron area.

A Ross spokesman said about 23,000,000 gal. of gasoline and home heating oil will be handled by his company this year.

The new subsidiary will not handle Ohio Oil's Marathan products until contracts with current suppliers have been terminated. The Ross company will continue to operate under its present name as a wholly owned Ohio subsidiary.

Shell, Tidewater Offer Raise

. . . of 5% for 1 year. This knocks down part of unions' opposition to the same percentage on a 2-year base.

A 5% GENERAL wage increase on a 1-year basis was offered Shell and Tidewater employes last week as the tempo of wage talks in the oil industry picked up.

The latest offers removed one objection unions have expressed to earlier 5% offers tied to a 2-year contract. Union leaders want a 1-year contract or much larger raise if spread over 2 years.

Both Shell and Tidewater put an effective date of December 1 on their offers, but Shell's must be accepted by December 23 and Tidewater's by December 27.

Tidewater's announcement was made by President George F. Getty II. He explained the increase was approved in order to maintain the company's competitive position in the industry. Estimated cost to Tidewater will be about $3 million annually.

Bulk of other unions, including the OCAW, has rejected similar 5% wage offers from other major oil companies because of the 2-year contract provisions. Latest rejection came from Plumbers and Pipefitters at California Standard's Richmond refinery.

The offer, however, is the central topic of bargaining sessions being held by management and union representatives in other companies.

Phillips Chemical Co., after its first 5% offer covering 2 years was rejected, reportedly countered with an offer of a 3.5% pay raise for 1 year. It was made to an OCAW local at the company's Pasadena, Tex., plant on the Houston ship channel.

The second meeting of Sinclair and OCAW representatives was held during the week in Kansas City at the request of the federal mediation service. The first such meeting in mid-November failed to reach any agreement on a new national contract for Sinclair.

A victory . . . The OCAW, fresh from an intraplant victory, is now preparing to make a pitch for higher wages and a louder voice in work assignment at Humble's big Baytown, Tex., refinery.

The international OCAW defeated the independent Baytown Employes Federation by a vote of 1,394 to 1,145 to retain its bargaining rights and clear the way for negotiations with management.

The balloting was necessary after an earlier plant election ended in a freakish tie of 1,146 to 1,146. An OCAW spokesman said his union had grown overconfident before the first vote but "went to work" for the runoff.

The BEF had represented the production and maintenance workers for

BRIEFS . . .

Electric Co. Raw gas will be processed at a daily average rate of 177,000 M.c.f. to produce 110,000 M.c.f. of sales gas, 650 tons of sulfur, and 14,600 bbl. of RVP condensate.

Properties and assets of the Sid Richardson Refining Co., Texas City, Tex., have been bought by Texas City Refining, Inc. The purchase included a petroleum terminal and the now inoperative Richardson plant. Texas City Refining has no immediate expansion plans but will survey the plant equipment for possible use.

A $9,300,000 gas plant will be built at Sun Oil's refinery at Marcus Hook, Pa., with startup scheduled for November 1961. It will have initial daily capacity to separate 14,400,000 cu. ft. of dry gas, 7,100 bbl. of liquefied propane and propylene, 13,200 bbl. of liquefied butane and 18,000 bbl. of gasoline. The new plant will replace two older ones of pre-World War II vintage.

Los Angeles County has extended the deadline 6 months on lowering the olefin content of gasoline sold in the county. This delay could mean a savings of millions to refiners. The industry hopes a current study will show the olefin content of gasoline has no relation to the olefin content of auto exhaust. Smog regulations specify gasoline sold in the county must have an olefin content of 18% or less. This is slated to be cut to 12% by June 30, 1962, unless the study shows the drop is not necessary. Many refiners would have to add downstream processing to keep olefin content to 12%.

Also for Refiners . . .

IN THE NEWS: Petrochemical markets again provide fastest growing outlet for LPG which is enjoying another record year in 1960 (p. 49) . . . New circular service station, loaded with new marketing innovations, is opened in Tulsa by DX Sunray (p. 52) . . . Giant petrochemical complex is taking shape along the Delaware River Valley near Philadelphia (p. 54) . . . Shell and Tidewater offer 5% general pay raise but for a 1-year period (p. 57) . . . OCDM rejects American tanker owners' bid for half of import business (p. 60) . . . Humble's refining operations are regrouped under a single manufacturing division (p. 66).

PLUS THESE TECHNICAL REPORTS: New tool permits onstream corrosion checkup (p. 72) . . . Peracetic acid process opens new way to epoxies (p. 78).

23 years before it lost to the OCAW in August, 1959. The independents, however, obtained enough signatures this year to force another election. The BEF still represents about 350 technical workers in the company.

The program . . . OCAW local has served notice on Humble it will follow the national pattern at Baytown.

National OCAW policy this year calls for an 18-cents-an-hour wage increase for all workers. Negotiations on wages at Baytown are not expected to start before the Christmas holidays.

The regular work contract, which expires February 10, will be negotiated after the holidays. The union gave 60-day notice on December 9 it will terminate the contract on schedule.

Offshore Wrangle

. . . inches ahead in U. S. high court proceedings.

ALTHOUGH the U. S. Supreme Court took another step last week in the offshore boundary dispute, it left two major questions unsettled.

The court did nothing to further the precise location of a state's seaward boundary, nor did it rule on Louisiana's claim to an old Coast Guard line as the starting point for that state's submerged lands.

The latter is particularly important to Louisiana because the Coast Guard line is, at some points, many miles from shore. Should the state's claim to that line be granted, it would gain possession of most of the disputed areas which otherwise would go to the federal Government under the court's 3 geographical miles ruling.

Actually, last week's court decree did little more than set in legal motion the earlier submerged lands decision.

It specified that Texas and Florida are entitled to offshore boundaries of 3 leagues, while Louisiana, Mississippi and Alabama are restricted to 3 geographical miles.

The court noted that it still has several other actions to take before it is through with the case.

It also dismissed a motion by Texas for severance from any further action on the case. (Texas has been grouped with the other Gulf Coast states but had requested to be considered separately.)

The court denied a motion by Louisiana to transfer the case to a district court.

It rejected all motions to take depositions or present evidence.

As it stands now, the offshore boundary dispute still has a long way to go before it is permanently settled.

Photos Cut Down Field Trips for

THE USE of photographs for better company communications is saving dollars for Arkansas Fuel Oil Co., by cutting down on trouble-shooting field trips.

Home-office engineers can literally "see" what's going on in the field simply by referring to photographs.

When Arkansas Fuel installs a field processing unit, for example, pictures of the installation are made from every angle. Three identical sets of prints are then made—one for the home office, one for the district superintendent's office at Corpus Christi, and one for the plant in the field.

For durability, and page-number reference, pictures are made up into "books" before being mailed out. To make up the books, pictures are placed back to back, laminated together, and then bound loose-leaf style with plastic binders.

Trouble-shooting by phone . . . Just how Arkansas Fuel saves trips by its engineers is shown when trouble comes.

The plant operator, if necessary, phones either the district superintendent or the engineering department in the home office. If there is any question as to what they are talking about, or as to what particular piece of equipment needs attention, then the man in the field and the man at the other end of the phone can refer to identical page numbers and pictures. Chances for misunderstanding, or of ordering the wrong piece of equipment, are eliminated.

The system has many other advantages. When adding to plant facilities, determination of additional equipment is often made, the purchase order completed, and placement of the units at the site directed by personnel who have never left home base.

Another important advantage is the ability to acquaint new employes in the office with field practices and field equipment, without going to the expense of making field trips.

"It may seem like we're overdoing a good thing," an Arkansas Fuel engineer says, "when we take pictures of piping or electrical connections which later will be buried, covered, or obstructed by other equipment. But we

1 A picture record is made of Arkansas Fuel's plants and compiled in book form. A copy of the book is kept by the plant, the district superintendent and the home office.

2 When trouble strikes the plant operator has the photo book before him as he calls the district office.

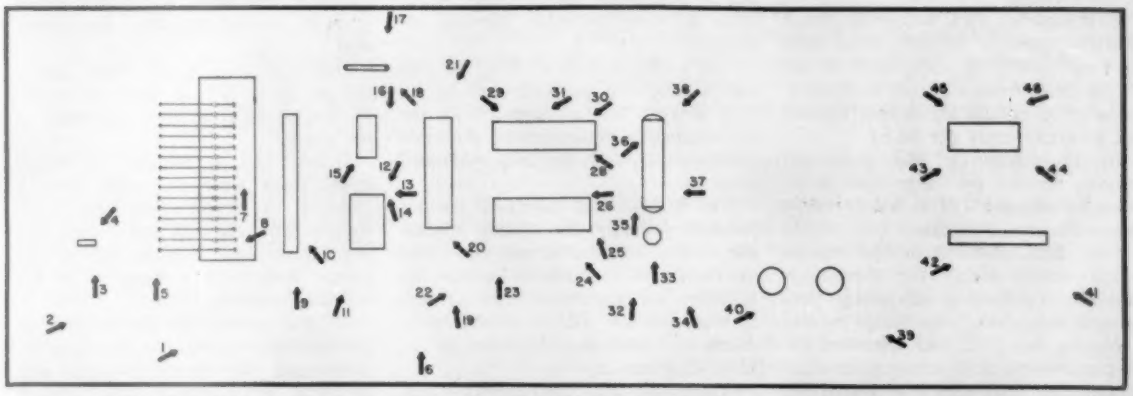
3 At the other end of the line the production engineer has the same photos to help him "see" and diagnose.

Problem-Solving

can tell, without digging anything up, whether or not an underground pipe has a butt-end, tee or ell connection."

Arkansas Fuel's photo department is called upon for every type of picture situation. But the payoff for engineering, they feel, is all the field trips eliminated by having a complete picture file. When emergencies come, or construction plans start brewing, Arkansas Fuel's engineers hit the photo records rather than the road.

4 Trouble-shooting conference is held in the district office. With the help of the picture book, corrective action can be quickly decided.



INDEX FOR PHOTOS in the picture book shows where the photographer was standing and the camera angle.

Court Ruling Seen as Threat to Area Pricing

• In bouncing two gas cases back to FPC for rehearing, a federal appeals court hints the commission may be lax in attempts to thwart rising prices. Nature of the cases stirs doubts on acceptance of area-pricing by courts.

THE FEDERAL Power Commission has, once again, run into a court ruling which further complicates its regulatory problems and which may cast a long shadow of doubt over the FPC's new area-pricing approach.

Last week, a U. S. Court of Appeals in Washington sent two cases back to the FPC for rehearing.

The court scolded the commission for not reviewing the prices in the cases, implying that the commission was not making enough of an effort to hold back the rise of natural-gas prices.

Area pricing was not an issue in either instance. But the sending back of a case where the proposed price was in line with a ceiling set for that area caused some observers to wonder if the courts will eventually accept area prices at all or, instead, insist on individual price justifications.

If the latter course were chosen, it would tend to make an area-pricing approach impossible.

One of the two cases ruled on by the U. S. Court of Appeals concerned a project involving Texas Gas Transmission Corp., Texas Eastern Gas Transmission Corp., and Hope Natural Gas Co.

Hope Natural had purchased gas from 21 producers in Louisiana and had arranged with Texas Gas and Texas Eastern to transport the gas.

The producers were to get 21 cents per M.c.f. for 5% of the daily production and 21.5 cents per M.c.f. for the remainder. Taxes were to be added to each price.

The other case concerned the price of gas from leaseholds purchased by Texas Eastern.

Last October, FPC had given Texas Eastern authority to buy leases held by four producing companies in the Rayne field, Acadia Parish, Louisiana, for a price on the leases that figured out to 20.59 cents per M.c.f.

In the opinion of the court—an opinion written by Judge George T. Washington—the FPC failed to justify the prices in either case.

"We find nothing in the record which would justify the conclusion that the commission adequately performed this duty," the judge wrote.

Noting that FPC had approved the first case without attaching price conditions, the judge said it appeared the commission had done so chiefly through fear that the entire deal would fall through unless it approved the proposed price.

The judge said sharply that the commission cannot abdicate its responsibility to regulate prices "simply because the parties tell it that the transaction will collapse unless the full price is approved."

Judge Washington cited the U. S. Supreme Court's decision in the CATCO case as a requirement that the commission determine prices "in the public interest."

"In the contest of a rising natural-gas market," Washington ruled, "this demands a real administrative effort to hold back prices."

In the case of the purchase of gas by Hope Natural, the judge said that either the producers should be required to provide evidence to justify the price sought, or they should accept a conditioned price which would be subject to later adjustments.

In the lease-purchase case, the court ruled that gas acquisition costs must be justified regardless of the manner in which the gas was obtained.

It appears that if the FPC adjusts the proposed prices downward after rehearings, it would either have to lower its present area-price ceiling in southern Louisiana to that level or face a challenge of any ceiling price approved without a full investigation.

OCDM Kills "50% Imports" Bid

. . . by tanker owners. Agency says there's no need of a rule that half of oil imports must move under U. S. flag.

THE FEDERAL Government is rejecting a plea by a group of independent tanker owners for a requirement that 50% of all oil imported into the U. S. be hauled in U .S.-flag tankers.

The Office of Civil and Defense Mobilization ruled, in a report planned for issuance late last week, that such action was not necessary as a national security measure.

OCDM did concede that the tanker owners who have pressed for the 50% requirement have suffered economic hardship "in varying degrees." But, it said, OCDM intervention could not be predicated on hardship "unrelated to some threat to national security."

The tanker owners making the plea had argued that protection of U. S.-flag tankers was as essential as the Government's protection of domestic producers through the import-control program.

But OCDM said the cases are not parallel. Actually, the agency argued, the control program already has aided domestic tanker operators because by reducing oil shipments from abroad, it has increased U. S. coastal shipments and made more business for the U. S.-flag tankers.

(Coastwise and intercoastal transportation of oil is reserved to U. S.-flag tankers under existing regulations.)

"The employment of tankers in the domestic trade in deadweight tons was higher as of March 31 than on any of the corresponding dates in any previous year," the agency said in the report.

OCDM hinted that it is not sure that dependence on tankers for coastal shipments is a wise thing, anyway, from a defense standpoint.

"It is relevant that overland imports were exempt from the oil-import-control program, indicating that waterborne carriage is less desirable than overland delivery from the standpoint of national security," the agency said.

Furthermore, OCDM cited statistics to show that in domestic trade, U. S.-flag tankers have continued to be active.

It said that at the end of March 1948, there were 277 ships with a capacity of almost 4 million deadweight tons. On the same date this year, there were 226 tankers in domestic trade with a capacity of 4.4 million deadweight tons.

OCDM quoted the Department of Commerce as predicting that ship requirements for domestic trade will continue at essentially the present level in 1961 and 1962, with the like-

lihood of an upswing starting in 1963.

As for the charge frequently made that the existing tanker fleet is getting old and that the Government should therefore take steps to encourage new ship construction, OCDM took this view:

It is true that about 60% of the tanker fleet was built some 15 years or more ago, but, said OCDM, there is little economic point in scrapping a tanker as long as demand for its use exists. And it noted that tanker construction is continuing at a reasonably substantial rate.

OCDM also refused to accept the argument that tankers flying the flags of Panama, Liberia, or Honduras probably would not be available to the U. S. in time of emergency.

It said it had received assurances from the Commerce and Defense Departments that most of such ships would be available, and concluded that this fleet is "a dependable supplement to the U. S.-flag fleet for use in war or other emergencies."

The agency also revealed that the State Treasury Departments had vigorously opposed the proposal to require the shipping of 50% of oil imports in U. S.-flag ships. They said that such action would likely result in similar restrictive action by other nations, and pointed out that this nation currently is seeking to encourage the expansion of international trade on a non-discriminatory basis.

The limitation move had been sought by two groups of tanker operators who own 22 tankers, and by eight maritime unions.

Opposition was led primarily by the American Committee for Flags of Necessity (comprised chiefly of major oil firms), and a large number of individual oil companies.

Petrochemical Contracts Let

CONTRACTS have been awarded for construction of aromatics facilities for Tennessee Oil Refining Co., a division of Tennessee Gas Transmission Co., at its Chalmette, La., refinery (OGJ, Feb. 29, p. 56).

The aromatics facilities will have these units: A 6,000-bbl.-daily catalytic reformer; a 2,200-bbl.-daily extraction unit for producing benzene, toluene, and xylene; a 20,000,000-lb.-yearly orthoxylene fractionator; and a 22,000,000 - lb. - yearly ethylbenzene fractionator.

Bechtel Corp. has the contracts for the catalytic reformer and orthoxylene fractionator. Badger Manufacturing Co. has the contracts for the extraction unit and ethylbenzene fractionator.

watching WASHINGTON

Clyde La Motte

• New Interior Secretary will proceed with caution . . .

IT APPEARS reasonably safe to assume that Stewart L. Udall will not dismantle and reconstruct the oil and gas administrative machinery at the Department of Interior any time soon after taking office as secretary in January.

For one thing, the congressman from Arizona readily concedes that he is no expert on oil-import-control matters or on other oil-related problems.

He points out that the control program was set up and is directed by the executive branch of the Government, and not by Congress. Since his government service has been in Congress, import problems have not fallen within his sphere of operation.

"Practically all I know about the import program is what I have read in the papers," Udall commented the other day.

He did indicate that the oil-import issue was one of the problems that Secretary Fred Seaton touched on while briefing him on some of the subjects he would have to deal with. But Udall made it clear that it is a subject he wants to study before he reaches any conclusions.

A second reason why Udall is likely to proceed somewhat slowly at first is that he is not an experienced administrator. He was a practicing lawyer at the time he became a congressman in 1954, and neither the role as lawyer nor as House member bears any resemblance to the position he will soon assume.

This does not mean that Udall appears awed by the administrative responsibilities that will be his in the sprawling Interior Department with its vast array of assorted operations. Instead, Udall seems to have a calm confidence in himself. But he appears to want to get the feel of the new reins in his hands before he undertakes to guide Interior into new paths.

• Cabinet members look to Kennedy for their signals . . .

IS IS BECOMING more and more evident that most of the major action by the various agencies, including the Department of Interior, will be directed from the White House—at least in the early stages of the new Administration.

President-Elect Kennedy apparently wants a team approach. But have no doubt that he intends to be the quarterback. One senses that his appointees are keenly aware of this, too.

Udall, for example, in his first meeting with the Washington press, time and again answered questions with the remark that this was something he would discuss with Kennedy. And he implied that he sees his job primarily as one for the administration of Kennedy policies.

Even so, one does not get the idea that Udall is a yes-man. Those who know him are quick to emphasize that he is not. But the Interior Secretary-to-be knows who is boss and accepts that as the way it should be.

As a result, any major policy changes planned by Udall will no doubt be sent to the White House for approval before they are put into effect.

• Udall "image": A bright man who will learn fast . . .

UDALL MAKES a good first impression.True, he does not yet have the easy poise and polish of a Fred Seaton. But he displays an earnestness and a quiet drive that causes one to suspect Udall will work aggressively and intelligently at his job.

He is a young (40) bronzed man of athletic build, exuding vigor. His physique and his "burr" haircut give him an almost collegiate appearance—something like that of a youthful football coach.

Udall's new job will be his biggest challenge to date, of course. And he seemingly is looking forward to it with eagerness and relish, tinged with a bit of native caution.

Montana Crude Line Attacked

- Rival line charges that Conoco seeks monopoly and asks court to halt work on Glacier system spur.

A MONTANA pipeline company went into federal court last week to halt construction of a competitive crude-oil spur line into Central Montana by Continental Pipeline Co.

Crude Oil Pipeline Co., which recently bought out Powderriver Pipeline Co., contends that Continental seeks to create a monopoly and has made threats against producers and shippers if they fail to use the new line.

Continental quickly denied the charges and said it is "operating fairly and within its legal rights in a free competitive economy" in building the crude line.

The spur line in question is part of Continental's $13.5-million Glacier pipeline system now under construction. It will link northwestern and Central Montana to northern Wyoming and will be part of pipeline connections with the St. Louis and Chicago areas (OGJ, Oct. 24, p. 60).

The spur runs 55 miles northeast from the Glacier system mainline at Roundup and ties into several Central Montana fields. It would compete with the existing Crude Oil Pipeline Co. line, which extends from some of the same fields southwest to Billings. Both are 6-in. lines.

Industry sources said last week that when Continental, a subsidiary of Continental Oil Co., Houston, was contemplating the Glacier system it tried to buy the existing line from Powderriver Pipeline Co. but failed. Later, Powderriver sold out to Crude Oil Pipeline. The deal was completed October 11, a week before Continental announced the Glacier system.

Crude Oil Pipeline last week asked the federal district court in Denver for a permanent injunction against Continental to prevent completion of the spur line. Basically, the application argued that Continental seeks to monopolize marketing of crude in the Rocky Mountain area.

Continental said the spur line is scheduled for completion soon, and that work would continue on the section between Billings and Laurel and south into Byron, Wyo.

Work on the northwestern section between Cut Bank and Roundup will start when the southern portion is finished.

Any legal or other delay, Continental said, would cause economic loss to Montana producers. The company also contended that transportation rates for the Glacier spur line from Central Montana fields to Billings and Laurel will be at least 5 cents per barrel cheaper than under existing rates.

The lawsuit charged that Continental had severed various sections of Crude Oil Pipeline's crude line. Continental replied that an independent contractor, who was not Continental's agent, had accidentally damaged gathering lines three times during construction of the spur line but repairs were made quickly.

TGT Outlines Its New Setup

- Corporate shuffle creates a subsidiary for handling most interests. Exception: Three gas-pipeline firms.

TENNESSEE Gas Transmission Co. has decided, in the main, how it will revise its corporate structure to separate its regulated pipeline and gas-transmission properties from its other widespread operations.

The Houston firm's new table of organization, effective early next year, will not disturb Tennessee Gas Pipeline Co., operating division for the basic Mexico-to-New England transmission system.

Two other gas transmission entities—Midwestern Gas Transmission Co. and East Tennessee Natural Gas Co.—will continue to operate as subsidiaries of the parent company. Midwestern moves gas into the upper Midwest, and East Tennessee operates a pipeline in Tennessee.

All other interests of the parent company will be placed under a new subsidiary, Tenneco Corp., which, in turn, will have a group of subsidiaries under it.

Chief of Tenneco's subsidiaries will be Tenneco Oil Co., which will operate as an integrated oil company in charge of Tennessee Gas's exploration, production, refining, and marketing—both domestic and foreign.

Tenneco Oil will take over the operations of three companies which heretofore have been divisions of the parent Tennessee Gas. The three are Tennessee Gas & Oil Co., the exploration and production firm; Tennessee Oil Refining Co., the refining and marketing firm; and Tennessee Overseas Co., which handles foreign operations.

Tenneco's other subsidiaries will consist of Tennessee Gas Building Corp., which has charge of plans for a new building for the company; Ten Ten Travis Corp., which operates the company's parking garage; and Tennessee Life Insurance Co. Also Tenneco will take over Tennessee Gas's 50% ownership of Petro-Tex Chemical Corp., owner-operator of a petrochemical plant at Houston.

Officers of Tenneco were drawn from Tennessee Gas's organization. Gardiner Symonds, board chairman of Tennessee Gas, also is board chairman of Tenneco. Cecil C. Johnson, former treasurer and senior vice president of Tennessee Gas, is president of Tenneco and board member.

Tenneco's chief subsidiary, Tenneco Oil, will have Symonds as board chairman and R. C. Graham as president and board member. Graham formerly was president of the Tennessee Gas and Oil Co. division. R. R. Dean is vice chairman (see p. 147 for other board members and officers).

Tenneco, as a fully integrated company, will operate in 24 states and six foreign countries. It will have production of 50,000 bbl. of crude daily, refineries with a daily throughput of 57,000 bbl. of crude, and marketing outlets for more than 80,000 bbl. of refined products daily.

The changes in the $1.5 billion Tennessee Gas organization help draw a sharper line between the company's government-regulated pipeline business and its nonregulated activities which have been added during TGT's 17-year lifetime (OGJ, Dec. 5, p. 81). The company expects the realignment to simplify its business before the Federal Power Commission, which regulates gas transmission operations.

In announcing the new setup, Tennessee Gas did not state specifically how it intends to separate activities in the integrated Tenneco Oil Co. except in the case of overseas operations. Tennessee Overseas Co. will become a subsidiary of Tenneco Oil and will operate the properties of six overseas companies.

Graham is president of Tennessee Overseas and S. C. Oliphant, senior vice president. Vice presidents are J. M. Browing, S. P. King, Edwin Ross, and A. R. West.

Government Flings Antitrust Suit at Phillips

- Justice Department aims to squelch any move to "take over" Union Oil of California. Union backs the suit.

THE JUSTICE Department is trying to block any effort by Phillips Petroleum Co. to gain control of Union Oil Co. of California.

In a civil suit filed in federal district court in Los Angeles, the department seeks to force Phillips to sell the 15% common-stock interest it holds in Union. And until the sale of the stock is made, Justice wants to enjoin Phillips from buying any more stock and from voting the stock it holds.

The Government's complaint is based on both "actual and potential" competition between the two companies and covers virtually every phase of oil operations.

George Haddock, who represents the Justice Department's antitrust division in Los Angeles, says the complaint spans a wide range of oil activities because the case involves "two similarly, vertically integrated companies."

Competition at the retail gasoline level is only one aspect of the Government's action against Phillips and Union. The complaint also cites the competition between Phillips and Union for crude-oil and natural-gas reserves, in the liquefied petroleum gas field, and in petrochemicals.

Actually, there is virtually no retail marketing competition between the two companies. Union markets exclusively in western states while Phillips markets east of Union's territory. There is a slight overlap along the fringe of Union's marketing area, but Phillips has no marketing or refining operations in California where Union has about 10% of the retail market.

Both companies, of course, have widespread producing and exploration activities throughout the oil patch. Phillips has no production in California and its exploration currently is confined to a part interest in two offshore tracts acquired in 1958.

The Government's action came at a time when there was intense interest on the West Coast in regard to sales of companies.

Stockholders of Monterey Oil Co., Los Angeles, are due to hold a special meeting December 22 to vote on a proposal to sell out to Humble Oil & Refining Co. Honolulu Oil Corp., San Francisco, is receiving bids from companies interested in buying its stock.

However, neither Monterey nor Honolulu is an integrated company, so the Government's action in the Phillips-Union deal may have no bearing on their sales. To date no Justice Department opposition has been voiced to either the Monterey or Honolulu sales.

Next action scheduled in the Phillips-Union case is for representatives of the two companies to appear in court in Los Angeles early in January to answer the charges. The companies have 20 days after issuance of a summons to answer the complaints.

A trial date may be set early in January, but Phillips likely will file some preliminary motions which would delay setting the date.

Union's reaction . . . Union's management obviously is pleased with the Government's action.

Reese H. Taylor, Union chairman and chief executive officer, predicted the Government will be successful in its attempt to stymie Phillips' bid to gain control of Union.

In a letter to stockholders last week, Taylor said:

"The antitrust laws are intended to prevent the elimination or lessening of such (actual or potential) competition. Consequently, we may reasonably expect that the Government will be successful in this suit."

The Union chairman pointed out he had revealed in an earlier letter how Phillips had "secretly" acquired a substantial share of Union's stock. As of November 30, Phillips held 1,263,200 shares of Union stock, making it the company's largest shareholder.

In Bartlesville, Phillips officials declined to make any comment on the suit.

The investigation . . . The Los Angeles suit is based in part on work done by the Federal Trade Commission.

The Justice Department received the information from the FTC late in October. The FTC had been following the trading of Union stock after it was disclosed in May that Phillips had acquired a 10% interest in the West Coast company.

What about Gulf? . . . Phillips is only one of the big international companies which would like to grow on the West Coast by buying Union.

Gulf Oil Corp. holds $120-million worth of 3¼% debentures which can be converted into Union common stock.

No reference is made to the Gulf debentures in the Government's complaint.

Union has reserved 2,647,837 shares of unissued common stock to cover the debentures. The company is scheduled to start retiring the debentures in 1967.

The Phillips-Union case may provide an answer to a big question posed last week by an oil man:

"If you can't buy your way into the California market, how do you get established out here?"

Says Bicks: Case is One of Most Important

THE Federal Government's move to end acquisition and ownership of Union Oil Co. stock by Phillips Petroleum Co. is another indication of the emphasis the Department of Justice is giving to its crackdown on oil mergers.

The fact that Phillips says it has purchased the stock for investment purposes has not swayed Justice Department officials.

In the civil antitrust complaint, the Government pointedly alleges that the acquisition of the stock of Union "was not solely for investment purposes."

Robert A. Bicks, the acting assistant attorney general who heads up the antitrust division, terms the Government's action against Phillips as one of the most important cases to be brought under Section 7 of the Clayton Act.

Bicks has made it clear during his tenure that he considers mergers as the greatest threat to oil-industry competition. As a result, most of his division's efforts affecting oil have been aimed at blocking or breaking up mergers.

Bicks noted that the Justice Department moved in quickly on this case, once it had been referred to the Justice Department by the Federal Trade Commission.

"Within less than 2 months after

the FTC papers arrived here, this case has been prepared and filed," he said.

Gaining control . . . The Justice Department maintains that Phillips already has acquired enough Union stock to give it a considerable measure of control over that firm.

The Government complaint says that Phillips has purchased "not less" than 1,262,700 shares — constituting almost 15% of Union's total common stock. Phillips spent more than $50 million in less than 2 years in acquiring that stock, the Government says.

The next largest Union stockholder, according to the Government, holds less than 3% of Union's outstanding stock.

Phillips' stock acquisitions, under California law, should be sufficient to elect three directors to Union's board, the Government alleges.

The obvious Government implication is that Phillips could soon be calling the tune for Union.

The size factor . . . Although Government antitrust officials have insisted that size is not the sole yardstick, nor necessarily the key one, in antimerger action, the Government complaint against Phillips dwells at length on the matter of size.

The Government alleges that the acquisition of control of Union by Phillips would increase Phillips' ranking in the following categories:

Texas Thinking of Kicking up Oil Flow in February

THE Texas Railroad Commission last week continued December's 9-day producing pattern for January, but it indicated it's tired of doing the nation's job of holding down production.

Chairman E. O. Thompson said Texas has held allowables low for a year, while oil from other states has flowed into Texas.

After January, he said, Texas "may relax" its restrictions on production and "let Texas oil fill the demand for Texas oil."

The commission's action in setting 9 days fixes the daily flow at 2,799,157 bbl. daily for January. This is slightly lower than the allowable initially set for December, but slightly higher than the actual figure on December 3.

. . . **From eighth** to seventh in total assets of U. S. oil firms.

. . . **From ninth** to seventh in net production of crude oil.

. . . **From eighth** to third in crude-oil refining west of the Mississippi.

. . . **From ninth** to sixth in sale of all the refined petroleum products.

Furthermore, the Government alleges that Phillips is the largest producer and marketer of natural-gas liquids in the U. S., producing and marketing about 11% of all natural-gas liquids.

It also notes that Phillips already ranks first in net production of natural gas—nearly twice that of the next firm.

As the Justice Department views it, the stock acquisition would not only increase Phillips' size but would tend to eliminate Union as a competitive factor.

This, in turn, the Government argues, would tend to mean less competition all along the line—from production to the sale of finished products.

And, it would tend to lessen the market for suppliers who now sell to Phillips or Union, or both, the Government argues, because only one buyer would exist where there had been two before.

Bicks has said in the past that he wants to make sure that the oil industry does not become an industry made up of only a few giant companies—as already exists in the automobile and basic steel industries.

His all-out efforts to block oil mergers shows that he is attempting to back his words with action.

Whether this policy will continue when the new administration takes office remains to be seen.

Shell Makes Pitch for Oregon Tidelands

- Company also starts its first well in California tidelands. Oregon deal would give Shell lease on 600,000 acres of rank wildcat territory.

SHELL Oil Co., one of the biggest operators in the Gulf of Mexico, made two moves last week toward becoming an established operator in the tidelands along the Pacific Coast.

The company laid a deal before the Oregon Land Board to lease the state's entire tidelands—600,000 acres all told—and at the same time spudded its first well in the waters off California.

The deal for the Oregon acreage is an offer to drill 7,000 ft. of hole within 2 years. Shell is seeking a 10-year lease on 541,000 acres along the coast line as well as 59,000 acres in the Columbia River area. The coastline acreage would extend 3 nautical miles offshore.

Edgar T. Pierce, clerk of the Land Board, said Shell's offer is being studied by the Attorney General to see what procedure the state would take in awarding the lease. There has been some talk of opening the land for competitive bidding rather than granting Shell an exclusive deal, but Pierce indicated the chances of competitive bidding are remote since the area is strictly rank wildcat territory.

Some other offers for the acreage have been received, but "none that are important," Pierce said.

Shell has offered to pay an annual rental of 25 cents an acre or a total of $150,000. The royalty rate would be 12½%. Pierce says these are the same terms under which lands on shore have been leased.

The three-man Land Board will take no action on the application until it has cleared the attorney general's office.

California well . . . Shell's first well off California will give the company half interest in Parcel B, a 3,840-acre block under lease to Standard Oil Co. of California and Humble Oil & Refining Co. The block is off Santa Barbara County.

Shell will get the seaward half of the block for drilling the well. Owners will retain an interest in the Shell portion of the block.

The wildcat, Shell Refugio State No. 1, is being drilled from the CUSS I, a floating drilling ship operated by Global Marine Drilling Co. Socal, operator on the remainder of the block, is drilling below 4,300 ft. on a well about 2 miles from the Shell well. One dry hole has been drilled on the block.

Parcel B is in the area where the state plans to lease several blocks, letting them go one at a time. The State Lands Commission will meet this week to announce the next block. One block several miles west of Parcel B is already being processed for leasing.

Texaco Blueprints Huge 5-Year Spending Plan

• Flushed with higher earnings and glowing prospects, company earmarks a whopping $3 billion for capital outlays. Board Chairman Long sketches rosy vista for free-world suppliers in the coming decade and shrugs at Russia.

A $3-BILLION capital-expenditures program is planned by Texaco Inc. during the next 5 years.

This is in addition to Texaco's equity in outlays of affiliated companies.

Earnings of the company for the first 9 months of the year were up 6.5% over 1959, despite weak prices at home and abroad during much of the period.

Texaco hung up the performance while maintaining capital and exploratory expenditures at a record level—$500,000,000 for 1960, some 41% above 1955. The 1960 spending level will be continued next year.

This picture of Texaco operations was outlined last week by Augustus C. Long, chairman of the board, in an address before the New York Society of Security Analysts. In tracing his company's growth and prospects, Long also said:

...The consent decree under which Standard Oil Co. (N. J.) agreed to operate has no effect on its plans with regard to joint foreign operation with Standard Oil Co. of California through the Caltex group.

...Russia's aggressive drive to increase oil exports to the free world will not cause major dislocations in world markets.

...Both the near-term and long-term prospects for the oil business are good, in the United States and the free foreign areas, with free-world demand expected to increase an average of over 1,000,000 bbl. daily during the next 10 years.

...Texaco is steadily increasing its share of the products market, especially in gasoline, and is making major changes in its distribution system.

...Texaco's gross well completions in the U. S. will increase from 1,595 in 1959 to 1,650 in 1960.

Foreign problems . . . Referring to Jersey's signing of a consent decree in the government's big cartel case, Long said his company had no such intentions (OGJ, Nov. 21, p. 143).

Speculation has been widespread that a splitup of Caltex along the Stanvac pattern would inevitably follow. But Long insisted that "this decision has had no effect on our attitude with respect to the cartel case, and we expect to continue to market through Caltex in all areas presently being served by that company."

Long viewed Russian penetration of free-world markets with only a fraction of the alarm expressed by some other executives of international companies.

"The American international companies undoubtedly will experience difficulties as a result of Soviet competition, but these will be limited principally to political areas," he said.

"Oil is the principal earner of foreign exchange for the Soviets, and their desire to achieve political ends will be tempered by what even to the Russians are the hard facts of economics, so I cannot believe they will be too anxious to upset their relatively small markets. Also, with the annual increase in world consumption, Soviet penetration should be absorbed without too much price destruction."

Demand . . . Long predicted a good year for the industry in 1961, although there may be a slight downturn in business conditions generally.

He forecast a demand increase of about 2% in the U. S. and 7% abroad, or 5% for the free world as a whole. He said the industry is in better shape than a year ago, both as to inventories and prices, and will enter the new year with better prospects.

For the next 10 years he forecast a rise in free-world consumption of 5 to 6% annually, from 19,000,000 bbl. daily to 31,000,000 by 1970. And this estimate may be conservative, he said.

Marketing . . . Long said Texaco has reorganized the administration of its greater emphasis on long-range planning and cost reduction.

The company is seeking to add to its 40,000 domestic outlets and to boost individual station volume.

"This is causing a major change in our distribution system," he said, "as we are seeking on a selective basis to obtain fewer but larger stations with complete service facilities."

Texaco markets lube oils in all 50 states of the union. By the end of the first quarter of next year, the company will be operating a number of service stations in Hawaii—thus becoming the only gasoline brand-name marketer in every state.

Pembina Fights Pipeline Charter Bid

PEMBINA Pipe Line, Ltd., Calgary, has voiced strong opposition to the incorporation of Aurora Pipe Line Co. on grounds that it would be American-controlled and that future pipelines in Canada should be home-owned.

James A. Scott, president of Pembina, told the Canadian Senate banking committee he felt his company should be given a "quasi-monopoly" in LPG transportation in western Canada.

Aurora seeks federal incorporation under a private bill introduced by Sen. Gunnar Thorvaldson, Manitoba (OGJ, Dec. 12, p. 78). The bill was approved by the committee early this month after a detailed study.

Aurora would be owned by Hudson's Bay Oil & Gas Co., Ltd., Calgary. The majority of the Hudson's Bay Oil & Gas shares are owned by the Continental Oil Co. of the U. S. and the balance by the Hudson's Bay Co.

Kenneth H. Burgess, Calgary, vice president of Hudson's Bay Oil & Gas, said Aurora plans to transport liquid hydrocarbons from southwestern Alberta to the international boundary through a 42-mile line.

The line would connect at the border with a pipeline system being built by Continental Pipe Line Co., a subsidiary of Continental Oil. Product would be marketed in the Rocky Mountain region and in Mid-Continent areas of the U. S., including Chicago.

Scott contended that Pembina is interested only in transporting oils, gases, and such byproducts as sulfur. He said this is one of the areas in which Canadian-owned companies can afford to operate. Huge sums, mostly American, are required for exploration and development of oil and gas resources, he pointed out.

According to Scott, Pembina is prepared to set up a network of pipelines to transport LPG produced throughout Alberta.

Six New Vice Presidents . . .

John W. Brice
Head of the
Central division
in Tulsa

W. W. Bryan
To head
New York's
Eastern division

Ray H. Horton
To run
Houston's
Southwest division

Russell H. Venn
Head of
Southeast region,
New Orleans

J. P. Warner
To head
refining division
in Houston

F. A. L. Holloway
On refining
planning group
in Houston

Humble's New Look: Four Regions, Three

HUMBLE Oil & Refining Co. has solved its huge and vexing organizational problems by going a dual route: geographical and functional.

By geography, it established four regions to handle exploration, production, and marketing.

By function, it established the manufacturing division at Houston to handle refining operations. And it retained its functional marine division, its Enjay Chemical Co., and its subsidiary Humble Pipe Line Co.

The organizational problems were created 15 months ago with the merger of most domestic operations of Standard Oil Co. (N. J.) into Humble. The following sweeping changes are among those announced last week:

. . . Humble's eight refineries are lumped into a single Houston-headquartered manufacturing division. This includes six refineries formerly controlled by Esso Standard, Carter's refinery in Billings, Mont., and Humble's refinery at Baytown, Tex.

. . . Esso Standard, as a name, becomes "Esso Standard, Eastern Region," in charge of marketing in 13 northeastern states. It loses five southern marketing states and all its vast refining operations. Headquarters remain in New York.

. . . The Carter Division disappears entirely as a name and becomes, in the main, the new Central Region. It loses some of its exploration territory but takes over the large marketing area of the Oklahoma-Pate Division in the upper middlewest. Tulsa remains as headquarters.

. . . The Humble Division becomes the Southwest Region, still headquartered at Houston but shorn of its exploration territory east of Texas and its Baytown refinery.

Newly created is the Southeast Region, formed by territory taken from Esso Standard, Humble, and Carter divisions and covering nine states. Its responsibility includes Humble's big South Lousiana and offshore Louisiana exploration and production. New Orleans will be the headquarters.

The new organizational plan became effective upon its announcement last week by President Morgan J. Davis at company headquarters in Houston. However, Davis said that, until the plan is implemented, the company will continue operating under its present system of supervision. The changeover will occur as quickly as operations permit.

Humble also explained, without elaboration, the relationship of the four regions and the operating divisions to the company's top management. They will "be responsible to Humble's executive committee."

The executive committee, which is unchanged by the reorganization, is comprised of Davis, executive vice presidents C. E. Reistle, Jr., and William Naden; vice presidents H. W. Ferguson, H. W. Haight, and D. W. Ramsey, Jr.

Humble made another thing clear. The reorganization does not affect the company's product brand names. These are determined "by factors other than this realignment."

The changes, however, give new emphasis to the need for a single nationwide brand name for gasoline in place of regional names such as Esso, Humble, Carter, Oklahoma, and Pate.

Eastern operations . . . Under the new plan, Esso Standard, Eastern Region, replaces the year-old Esso Standard Division of Humble.

Esso loses its refining operations and the marketing states of North and South Carolina, Tennessee, Arkansas, and Louisiana.

Remaining are the 13 states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia, plus Washington, D. C.

In addition, Ohio, a new marketing area, will come under Esso Standard.

Central Region . . . The former Carter Division takes on heavy new responsibilities in Humble's drive to become a nationwide marketer.

In addition to its traditional ten northwestern states (Washington, Oregon, Idaho, Montana, Wyoming, Utah, Colorado, North and South Dakota, and Nebraska), it now has Michigan, Kentucky, Indiana, Illinois, Missouri, Iowa, Minnesota, Wisconsin, Kansas, and northern Oklahoma.

Its responsibility in exploration and production is reduced by the loss of the southern two-thirds of Arkansas and northern Louisiana to the new Southwest Region.

PIPELINE

Deliveries by Trans Mountain Oil Pipe Line Co. averaged 113,559 bbls. per day in November. It was well above the November 1959, average of 86,615 bbls. per day, but far short of the 154,000-bbl. average in 1957 before import restrictions throttled the flow to U. S. refineries.

FPC approval will be sought by Panhandle Eastern Pipe Line Co. for construction of 298 miles of 30-in. loops and other facilities at a total cost of $46,480,000. The proposal would boost Panhandle's capacity by about 325,000,000 cu. ft. daily.

. . . and Five New General Managers

R. O. Goodykoontz
Moves to Tulsa to work under Brice

A. A. Diffey
No. 2 man with Bryan in New York

J. H. Galloway
Stays in Houston in Southwest division

C. G. Herrington
To New Orleans to work with Venn

J. D. Rogers
Takes top spot in new Marine division

Divisions

Southwest Region . . . The old Humble Division, which stretched originally from coast to coast, is now confined to the West and consists of Texas, southern Oklahoma, New Mexico, Arizona, Nevada, and California. Alaska and Hawaii also are in the Southwest Region, while Oregon and Washington are added for exploration and production only.

Southeast Region . . . To make a more compact geophysical package for its regional setup, Humble created the new Southeast Region by slicing off territory from three former divisions — Humble, Carter, and Esso Standard.

In addition to the five states where Esso Standard markets (North and South Carolina, Tennessee, Arkansas, and Louisiana), it will have responsibility for moving into four other states where Humble has no marketing—Mississippi, Alabama, Georgia, and Florida.

Who's Who in the Top Spots

MORGAN J. DAVIS will continue as Humble's president. The executive committee also remains intact.

Here are the new vice presidents:

Central division—John W. Brice, now head of the Carter Division in Tulsa and a Humble director. Brice joined Jersey Standard in 1927, has been a Jersey board member, Carter president and board chairman, and executive vice president of the reorganized Humble.

Eastern division—William W. Bryan, now president of Esso Standard Division, New York. He's a Jersey veteran of 37 years, mostly with Esso. He has held a number of sales-executive posts, was once marketing vice president of Carter. He was named Esso Standard president in July 1959.

Southwest division—Ray H. Horton is now president of the Humble Division in Houston. He joined Humble in 1930 as an oil-field worker, became a director in charge of employe relations in 1955, president in 1959.

Southeast division—Russell H. Venn is now manager of marketing for the Humble Division. He joined Humble as a chemical engineer in 1934, became manager of the refining department in 1955, manager of marketing in 1958, and a member of the management board in 1959.

Manufacturing—J. Prince Warner, new vice president and division general manager, is now general manager of manufacturing for Esso Standard and a vice president and member of the board of management. He joined Esso in 1929 at Baton Rouge, later was general superintendent at Baton Rouge and Baltimore. He became vice president and director in 1959.

Fred A. L. Holloway is vice president for manufacturing on the headquarters coordinating and planning group. He is now assistant general manager of manufacturing for Esso Standard in New York. He joined Esso at Baton Rouge in 1939, became East Coast manufacturing manager in 1956.

BRIEFS . . .

Gas will be taken by Natural Gas Pipeline Co. of America from a half-dozen independent producers in the Thompsonville and Taquachie Creek areas of Zapata, Jim Hogg, and Webb counties of Texas when the firm completes 50 miles of 20-in. laterals and 4.5 miles of 6-in. laterals to connect with its 26-in. system in Jim Wells County. FPC has authorized the expanded system, which will also add 33 miles of 10-in. laterals in the Normanna area.

Budget-type" authorizations of $5,000,000 each are being sought from the FPC by Tennessee Gas Transmission Co. and El Paso Natural Gas Co. No single expenditure is to exceed $500,000. Earlier, Texas Eastern Transmission asked for a similar authorization totaling $4,000,000.

A 6-in. pipeline spur into K. I. Sawyer Air Force Base, Marquette, Mich., has been completed by the Gustavson Oil Co., Escanaba, Mich. (OGJ, Nov. 7, p. 97). This gives the Air Force 23 complete pipeline spurs in a system that was started at Schilling AFB, Salina, Kans., in August 1954. The Sawyer line has a capacity of 600-900 bbl. hourly and will supplement regular fuel transportation.

Also for Pipeliners . . .

IN THE NEWS: Appeals court poses threat to area-pricing formula when it kicks back two cases to FPC for review (p. 60) . . . Crude Oil Pipeline goes into court to block expansion into Central Montana by Continental (p. 62) . . . TGT reorganizes its corporate setup to separate pipelining from other activities (p. 62) . . . Pembina Pipe Line asks for monopoly in LPG transportation in western Canada in opposing Aurora incorporation (p. 65).

PLUS THIS TECHNICAL REPORT: Why engine lubrication fails (p. 109).

Mobil Gets Lake Maracaibo Farmout

• Agreement with Creole for acreage in rich area of the big lake is viewed as one of the hottest farmout deals in recent times. Mobil has a better chance to balance crude production and sales; Creole gets a marketing boost.

MOBIL Oil Co. de Venezuela has made a development deal for Creole Petroleum Corp. acreage in Lake Maracaibo — unquestionably one of the most important farmouts in years.

The agreement is tied in with a long-term crude-purchase contract under which Mobil de Venezuela will buy about 13,000 bbl. daily of Venezuelan oil from Creole.

The twin agreements follow by a few weeks the start of the split-up of Standard-Vacuum Oil Co. Stanvac is jointly owned by Socony Mobil Oil Co., the parents of Mobil de Venezuela, and Jersey Standard, the parent of Creole (OGJ, Nov. 21, p. 143).

The move will undoubtedly go a long way toward helping Socony Mobil overcome its traditional imbalance of crude production in relation to sales. It offers Creole a long-term market for some of its crude, and an opportunity to have some of its undeveloped Lake Maracaibo acreage brought into production without cost to itself.

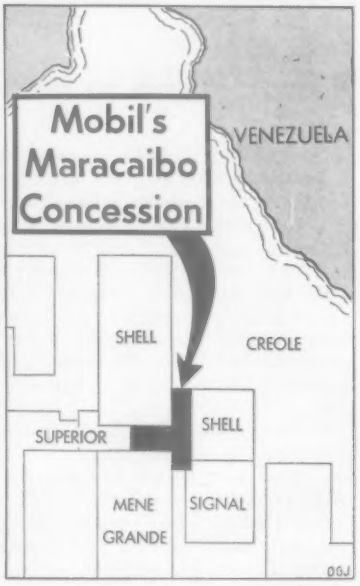
75-25 farmout . . . Under its development agreement, Mobil de Venezuela will finance and operate for the joint account of the two companies a part of Creole's undeveloped acreage in Lake Maracaibo. Mobil will receive 75% of the oil produced, Creole 25%. The production will be the first Mobil has in Lake Maracaibo.

The area involved is a T-shaped block covering 9,706,088 acres. It lies in the central lake area where prolific production has been developed by Superior Oil Co. and others.

Mobil is not buying a pig in a poke. There are three capped wells on the acreage, all of them in the north-south portion of the "T."

A fourth well in the farmout area, located less than a mile from the Superior tract, has been abandoned as a dry hole.

Other production in the immediate central lake area is prolific. Superior Oil is averaging 60,800 bbl. daily from its concession, and has produced more in individual months. Signal is



averaging about 24,300 bbl. daily from Block 4. Shell's lake blocks are producing about 285,000 bbl. daily, and Mene Grande has completed good producers in Blocks 2 and 3, near the Mobil farmout area.

Crude purchase pact . . . Mobil will buy a total of 112,500,000 bbl. of Tia Juana medium crude over a 22-year period. This amounts to about 13,000 bbl. daily. Mobil also will have the right to purchase up to an additional 100-million barrels of Tia Juana light crude from Creole.

The crude purchased under the agreement will be absorbed within Mobil's traditional crude markets. Most will remain in the Western Hemisphere, but some sales will probably be made in Eastern Hemisphere markets such as northern Europe. The company said it is hard to tell precisely where the crude will be processed.

There is speculation that Mobil might run some of the Tia Juana crude as supplemental feed for its new 50,000-bbl. El Palito refinery, which is built at the Caribbean terminal of a 211-mile 20-in. pipeline from fields in Barinas Province. Mobil is operator of the pipeline, which it owns jointly with Sinclair Oil and Refining.

Mobil's Barinas production is from Silvestre and Silvan fields. But most of its Venezuelan output of about 107,000 bbl. daily this year is from the State of Anzoategui in eastern Venezuela, with output moving to the coast via a 142-mile pipeline to Puerto Cabello.

Help for crude position . . . The farmout agreement will go a long way toward helping Mobil's crude supply and sales balance. The Mobil organization is traditionally short on crude in relation to its marketing.

The company's net crude production last year, including Canadian and other foreign production, was 669,000 bbl. daily. Of this 231,000 bbl. daily was produced in the U. S. and Canada and 438,000 bbl. daily was produced abroad.

This amounted to only about 62% of Mobil's world-wide sales, which averaged 1,074,000 bbl. daily. Sales included 655,000 bbl. daily sold in the U. S. and Canada, and 419,000 bbl. daily in foreign areas.

The company's refining capacity lies between these totals on production and sales. At the turn of the year, Mobil's total capacity was 939,000 bbl. daily of which 561,000 bbl. was in the U. S. and 378,000 bbl. abroad.

The gap between production and sales has widened in recent years. Mobil's net crude production increased 116,000 bbl. daily between 1955 and 1959. In the same period, sales were up 181,000 bbl. daily. Last year, net total product was up about 4%, while sales were up 9%.

Creole, on the other hand, is having trouble holding its export markets. Its Venezuelan output in the first 10 months of the year averaged 1,057,000 bbl. daily, off 0.8% from a year ago.

Historic Twist Sells Kerosine in Haiti

THE OLD "oil for the lamps of China" sales technique still moves kerosine for Jersey Standard.

In today's tough marketing competition, Esso Standard Oil S.A. successfully uses one of the industry's oldest and most famous sales tools to push a new market in Haiti.

"Oil for the lamps of China" was a sales program used by the old Standard Oil Co. before the turn of the century. The company spurred kerosine sales in China by selling kerosine lamps at cost and encouraging the Chinese public to use them for lighting.

A slight variation now builds kerosine sales in Haiti. Instead of lamps, Jersey's Caribbean affiliate sells low-cost kerosine stoves. And the company has the blessing and cooperation of the government.

Haiti was ripe for the Esso campaign because the public urgently needed to switch from charcoal to some other fuel for cooking. Deforestation and the burning-out of scrub land to obtain charcoal had caused a major erosion problem. The government estimates that wind and rain now wash about 5% of the nation's productive top soil into the sea each year.

Sixteen thousand stoves, each displaying the Esso trademark, are produced every month at a Haitian factory.

The government of Haiti declared a National Kerosine Week to promote stove sales. A widespread educational program includes posters showing the damage of deforestation and erosion.

HAITIAN WOMAN prepares to cook supper on kerosine stove made by Esso.

Tests Slated in North Chile

- Government company will spud two wildcats in nitrate area. Exploration also continues in the far south.

TWO WILDCATS will be spudded in extreme northern Chile about January 1.

The government company, ENAP, will drill one test at Pintados in Darapaca Province, the most northerly in Chile, and the other near Salar Pedernales in Atacama Province immediately to the south.

Both wells will be drilled on salt flats in Chile's nitrate area. The Salar Pedernales site is near an oil seep, and is within 15 miles of Anaconda's El Salvador copper mine. Loffland Bros. will be drilling contractor on the Pintados test, and Santa Fe Drilling at Salar Pedernales.

ENAP also continues to explore in the extreme south of Chile where it is producing 21,500 bbl. daily from fields on both sides of the Straits of Magellan. Most of the crude still is from fields on Tierra del Fuego. But some mainland production is now moving out through a 35-mile 8-in. pipeline from Faro Este oil field to a terminal at Gregorio.

Supplies from the mainland will be supplemented in April 1961, when a 50-mile 8-in. extension is completed to Faro Este from Daniel field, discovered in July.

Daniel may be Chile's best field. Four out of four wells have been completed in the 500-1,000-bbl.-daily range, and a total of 25 locations have been staked. If the fifth well now being completed is a producer, as expected, ENAP will have locations for a total of 60 wells on a 40-acre spacing. On production, the wells will be held down to a flow of 200-300 bbl. daily.

On Tierra del Fuego, construction has started on a 100,000 M.c.f. gasoline plant, which will be completed in August 1961. The plant will stabilize 15,000 bbl. of crude daily, and will repressure dry gas in Cullen and adjoining fields.

Libya Tightens Contracting

LIBYAN NATIONALS getting into the contracting business will have an easier time under new rules issued by the government.

In the future, permits will be granted to foreign drilling contractors or service companies only if no local company is available to do the job.

The Ministry of National Economy also has stipulated that permits will not be granted to any foreign company to carry out drilling or other technical operations for oil companies unless the concessionaire provides documentary evidence of need for the work.

When no local company is available, priority will be given to companies in which Libyans participate either financially or as employes.

Oil companies, themselves, must fill all jobs with Libyans whenever possible.

First Kyushu Refinery Set

SEVERAL Japanese companies are planning the first refinery to be built in Kyushu, one of Japan's biggest coal-producing areas.

Backers of the 40,000-bbl. plant include Yawata Chemical Co., a subsidiary of Yawata Iron & Steel Co., Kinoshita Shoten, West Japan Railroad Co., Taiyo Fishery Co., Kyushu Electric Power Co., Bridgestone Tire Co., and Onoda Cement Co.

Tohei Yasunaga, president of Yawata Chemical and leading promoter in the venture, and Hajime Shingai, deputy governor of Ohita Prefecture, have signed a contract covering the purchase of an 840-acre site on reclaimed land at Tsurusaki. The tentative name of the refining company is Kyushu Oil Co.

The first stage of land reclamation is scheduled for completion by the fall of 1961. Construction of the $44-million plant is expected to be completed a year later.

New Economic Plan for Venezuela Gains Favor

• Country would operate on a balanced budget. Oil companies and foreign sources would make loans to cover the nation's deficit.

VENEZUELA'S President Romulo Betancourt last week appeared to come out on top of the most touch-and-go political crisis since his young government came into power last year.

The President in one move headed off a Castro-style revolt by powerful leftists groups. He followed this up by preparing a new economic plan that appears to be both sound and at the same time is acceptable to leftist leaders who sought to overthrow him.

The oil industry is not directly involved in the power struggle. But leftists, who for the time being have pulled in their horns, are the source of much of the local antagonism toward private companies. The success or failure of the proposed new economic plan will go a long way in determining the economic stability of the country. This, in turn, will have a bearing on the billion dollar investments in oil.

The economic plan was formulated by Tomas Enrique Carillo Batalla, the new Finance Minister. It calls for operating the country on a balanced budget, and for heavy borrowing from domestic and foreign sources to pay off the current deficit of $560 million. This includes a $300 million deficit carried over from last year.

The proposed foreign borrowing would include a $300 million loan from the U. S., a $55 million loan from oil companies, and a $12 million loan from iron companies. If the plan is approved by the International Monetary Fund, a $100 million standby loan may be made available.

The latest word from Caracas is that the administration may seek as much as $900 million in loans. The foreign aid would be sought to finance development projects. Locally raised funds, including advance tax payments by oil and iron companies, are expected to be used to cover the current deficit.

The administration plan still needs the approval of the government. But President Betancourt is counting on the support of the leftist groups to put the plan across.

Background . . . The present economic plan is not the first attempt by President Betancourt's administration to pull the country's financial coals from the fire.

The former Finance Minister, Jose Antonio Mayobre, formulated a plan to sell oil dollars, bought at 3.09 bolivars to a dollar, at 4.05 to the dollar. This, in effect, would be a devaluation which would have worked without governmental controls, and would have balanced the budget.

The International Monetary Fund in Washington agreed to float a $100-million loan to back the bolivar, providing the government accepted the Mayobre plan and agreed to hold salaries in line.

When Dr. Mayobre returned to Caracas last month and presented his plan, however, he ran into a hornet's nest of opposition. President Betancourt approved. But a majority of his cabinet did not. This precipitated a crisis that forced the government to apply currency controls to prevent a flight of capital from the country.

This move, together with existing depressed business conditions, helped foment riots that shook Caracas.

One problem has been debts carried over from the old regime. When the Perez Jimenez dictatorship was overthrown in January 1958, it was discovered that the former government had run up $1.26 billion in debts without bothering to include them in its balance sheet.

Continued high expenditures by the new government, the paying off of the hidden debts, a jittery political situation, and a recession in some local industries led to a general loss of confidence in the economy.

Limits on Venezuelan Production Eased

VENEZUELA's Oil Minister Juan Pablo Perez Alfonzo has backed off slightly in his policy of limiting crude production to increases of 4% per year.

The minister said in Caracas that the limit is not rigid. He added that gains of 4% to 6% needed to sustain the country's normal economic development could be exceeded in an emergency.

Dr. Perez Alfonzo in the past has insisted that holding the price line was more important than increasing exports. He has indicated that a prorationing plan would be enforced on producing companies if necessary to hold the line. He also has been forcing oil companies to reduce the discount off posted prices to a maximum of 5% by the end of the year.

He now says that companies are free to sell as much oil as they can, provided the contracts are made at posted prices.

For the time being, Dr. Perez Alfonzo's policy is of academic interest only, since the gain in crude production still is less than 4% over a year ago. Dr. Perez Alfonzo contends that no markets are being lost because output has not slipped.

Others in Venezuela, including the Caracas Chamber of Commerce, argue that Middle East competitors are absorbing most of the growth in western European markets, while Venezuela barely holds its own.

Japanese to Use Turbodrills

THE first turbodrilling equipment ever used in Japan will go into operation in January.

Three sets of 6¾-in. Model T12M3 drills have been purchased in Russia by Teikoku Oil for development drilling in Katamachi field, Niigata Prefecture. The drills will be used on oil and gas wells in the 3,900-6,500-ft. range.

Each drill set costs about $7,000, including attachments. Teikoku Oil bought the equipment on the basis of reports that turbodrilling has proved extremely efficient in directional drilling in Austria, with both speed and accuracy in relation to direction.

A Russian engineer is scheduled to accompany the shipment, which is due for delivery in January.

At Celanese Corporation:

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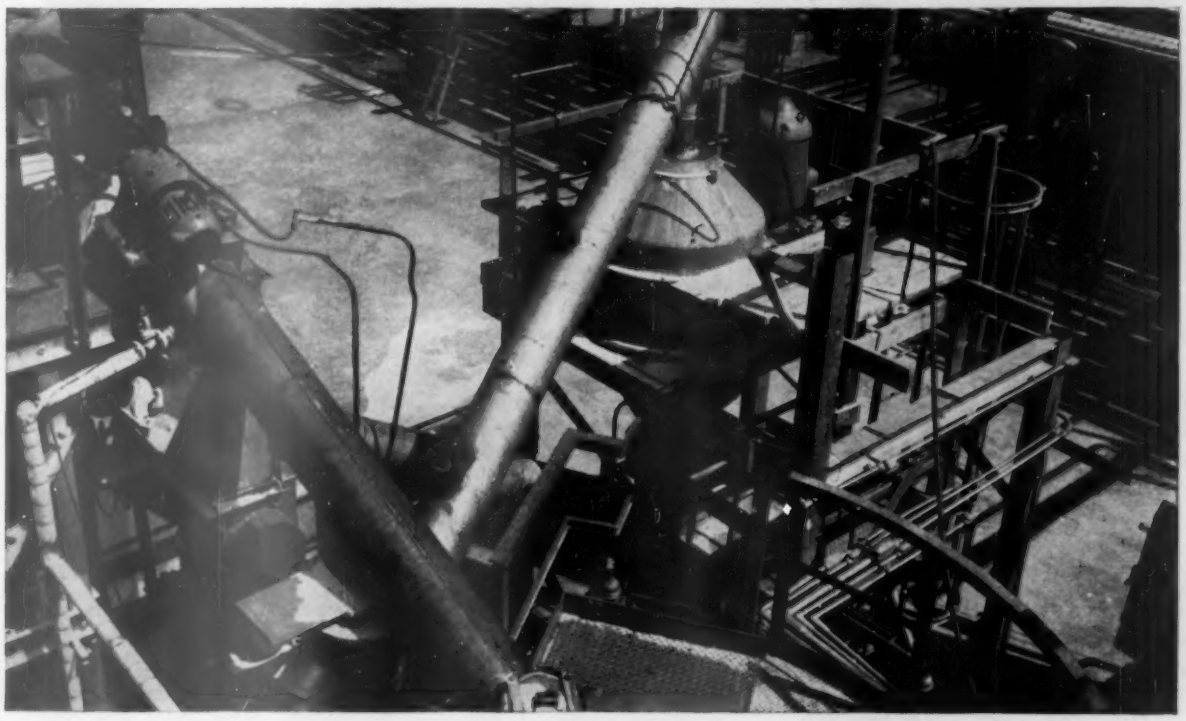
Dorr-Oliver MERCONE Screening Centrifuge in operation at Celanese plant. Feed enters the unit from the top, and separated solids are discharged at the lower end for feed into dryer unit.



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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

AN INSPECTION ENGINEER scans hot piping while refinery unit is on stream with a new pulse-echo ultrasonic device. He feeds . . .

INFORMATION to another engineer who reads reflections of the pulse-echo to determine the rate of corrosion of the piping.

New tool permits

Onstream refinery corrosion checkup

• By applying sonar to refinery inspection, a refiner now can inspect vessels, piping, and other equipment while units are on stream. This leads to better-planned turnarounds—and should result in more throughput due to less shutdown time.

BY CARL J. LAWRENCE
West Coast Editor

A NEW refinery tool which permits onstream inspection for corrosion in refinery equipment is saving time and money for a major West Coast refiner.

Experience with the new tool, called Ultragage by its developers, over the past several months shows the new equipment has three big advantages:

1. It permits onstream inspection for corrosion even on hot lines. This alone is a major stride in corrosion control since it eliminates much of the work normally done during a turnaround. The tool has been used on hot lines where the temperature exceeded 1,000° F.

2. The speed possible enables a refiner to get wider inspection coverage at less cost.

3. The tool reportedly is more accurate than any previous corrosion inspection method used in refineries. Measurement of wall thickness with an accuracy of 0.005 in. is possible.

This adaptation of ultrasonic testing to refinery maintenance was developed by International Inspection, Inc., which is headed by J. Randolph Richards as president. International Inspection is a subsidiary of Welex, Inc., Fort Worth. Richards and his associates worked 2 years adapting Ultragage to refinery operations, ironing out the bugs in the new tool in a West Coast refinery.

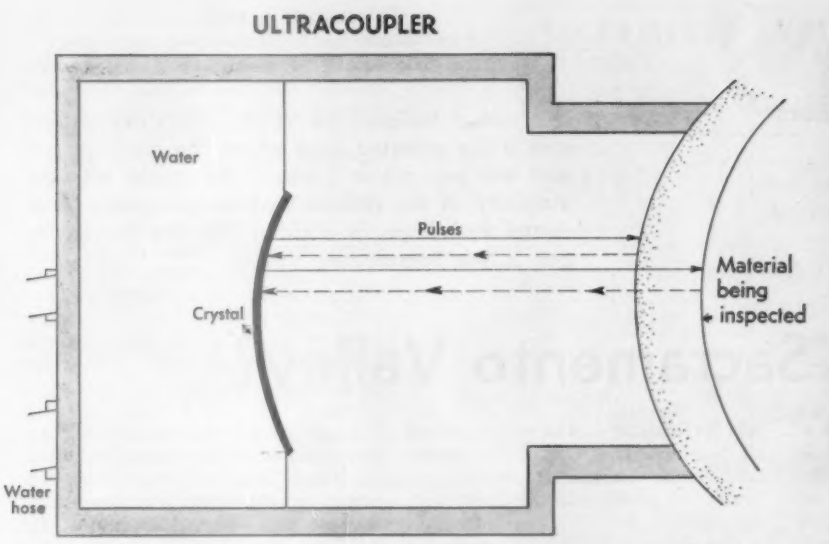
The tool. Ultragage employs the basic principles of pulse-echo ultrasonics or sonar.

The testing method actually involves two pieces of equipment, the Ultragage and the Ultracoupler. The latter is a scanning device which can be run quickly over the area to be inspected.

The Ultracoupler contains a crystal which is immersed in water. This is the key to the technique. Ultrasonic pulses sent from the Ultragage bounce from the inner and outer walls of the material being tested and back through the crystal. The reflection is fed back to the Ultragage, which translates the sound on a cathode-ray screen. A chart which plots the reflection also is available.

The crystal must be immersed in water since ultrasonic sound will not penetrate air. Keeping the crystal in water was one of the problems of developing the technique. However, this was worked out during the months of testing the equipment at a West Coast refinery. A water hose is connected to the Ultracoupler, keeping the crystal immersed.

Richards and his associates used their background in aviation inspection techniques in developing the new refinery tool. They developed the Immerscope, a device used to inspect aircraft parts immersed in water. However, the measurement possible with the refinery inspection tool is



ULTRASONIC SOUND which is used to check the corrosion rate in a refinery bounces from material being tested through a crystal immersed in water. The water is necessary since ultrasonic sound will not penetrate air. Reflections are fed from the Ultracoupler to the Ultragage, which translates them into the rate of corrosion.

MORE COMPLETE INSPECTION for corrosion on a tank bottom is possible with the Ultragage testing.

not part of the aircraft inspection technique.

The company recently moved into another field, offering Ultragage inspection for drill pipe.

How it's used. Several months' experience with Ultragage shows the tool is another avenue for refiners to take in cutting maintenance costs.

The onstream features of Ultragage, of course, is the big factor in cutting costs. But the speed with which a refiner can scan equipment also is important because you can cover a bigger area in a given time.

One refiner who has used the equipment estimates Ultragage testing is up to 10 times faster than other methods in scanning equipment. In the case of heat exchangers, it is esimated you can cover from 20 to 30% of exchanger shells in the time it took to inspect only 5% using other techniques.

When using Ultragage to inspect a vessel on stream, normally the areas where corrosion is common are checked first. If trouble crops up, the surrounding area is scanned and exact measurements made at the thinnest areas. With the more thorough check, it is possible to determine if corrosion has reached the stage to justify a visual inspection during the next turnaround.

A similar pattern is used to inspect tank bottoms. The bottoms are divided into 1-ft. strips. Two inches of each strip is then scanned. If a weak area is detected, then the surrounding area is checked.

This is a big improvement over previous methods. In the past, bottoms were spot checked. With Ultragage it is practical to cover one-sixth of the total surface area by scanning the 2-in. strips and come up with a comprehensive corrosion pattern.

Wider coverage also is possible in checking piping. In the past, spot checks normally were run every few feet. With Ultrasonic testing, the speed of the instrument makes it economical to scan the entire circumference of the pipe at the selected locations.

Unwrapping is the only preparation needed to measure insulated piping. In the past there were many cases where more money was spent dismantling, preparing, and cleaning piping for inspection than was spent on the actual inspection. Nothing has to be done to the interior of the piping to prepare it for Ultragage testing since what is in the pipe has no effect on the measurement acquired.

An idea of what can be done with the new equipment is apparent in a recent inspection of piping on a 70,000-bbl. combination thermal cracker and crude unit.

Ninety pipelines were scheduled to be inspected during the next turnaround, but after onstream inspection, it was learned only 10 needed visual inspection and the other 80 could await a later turnaround. The inspection also showed some of the pipes in better condition than had been anticipated. At a result, they were allowed to make another run.

Where it saves. Obviously, the big savings with Ultragage is the way a refiner can cut maintenance costs due to the amount of time and work saved by maintenance crews during a turnaround.

Results attained with the new inspection method also have been a factor in enabling one refiner to extend onstream time of some units, and extending turnaround intervals leads to more throughput, less shutdown time, and a more economical operation.

Turnarounds also can be better planned with the advanced information made possible with onstream inspection. Replacement parts can be obtained ahead of time and once a unit is shutdown, the work can be scheduled to the best advantage as far as manpower is concerned.

There also is a safety factor involved since the bulk of the inspecting normally done during a turnaround has already been done. This means less scaffolding and other equipment is needed, and this eliminates some of the hazards which might cause an accident.

In addition, the new tool also offers refiners the possibility of cutting over-all inspection costs once a corrosion pattern has been determined. When a corrosion pattern has been developed, a refiner can concentrate on those areas where maximum corrosion shows up and end up inspecting fewer locations in the long run.

Initially, more inspection that normal would be required to pinpoint those areas where maximum corrosion are occurring, but once this initial inspection is completed and a corrosion pattern developed, fewer inspections would be required.

BY EUGENE F. REID
Vice President and Exploration Manager
Occidental Petroleum Corp.

Why explore in California's Sacramento Valley?

This author believes the Valley offers exploration men a big untested area where the average gas well will pay out in 2 years. He speaks with the authority of the dollars that his company, Occidental Petroleum, is pouring into the search for gas in the Sacramento Valley.

DURING the first three quarters of 1960, 123 exploratory wells and 40 development wells were drilled in the Sacramento Valley. This level of activity in the area is the highest on record, and is the result of a combination of incentives that promises to induce an even greater drilling pace.

The purpose of this article is to examine these incentives, which may be classified in the general categories of geology, economics, and politics.

First, let us outline the area of interest.

The Sacramento Valley is the northern portion of the Great Central Valley of California, and extends from the vicinity of Modesto on the south to Redding on the north, an airline distance of 205 miles. Metamorphic and igneous rocks form the borders of the basin. The southern portion of the basin merges with the San Joaquin Valley, and in the vicinity of Mount Diablo and Suisun Bay it blends with the Coast Ranges.

The basin averages a little over 50 miles in width and measures about 11,600 sq. miles in area.

The sediments within the basin range in age from Upper Jurassic to Recent, and more than 90% are marine clastics. The composite maximum stratigraphic thickness is between 50,000 and 60,000 ft., with about 80% being of Cretaceous age.

Although the basin is known as a Cretaceous basin because of the great thickness of Cretaceous rocks, the Eocene and Paleocene have been the principal sources of the gas produced to date. In fact, Rio Vista field, producing from the Eocene and Paleocene sands, has produced more than 75% of the total cumulative gas extracted from the valley, and still contains more than 50% of the proved reserves.

Fig. 2 shows the Mesozoic sedimentary units through the Upper Jurassic. The Upper Cretaceous zonation is Goudkoff's. The rock units are all marine. The Upper Cretaceous sands — the Garzas, Blewett, and Tracy—all produce in the Tracy-Vernalis area.

The oldest sands shown productive are the Arbuckle-Beehive Bend sands which extend into the "F"-2 zone, but there are several wells in the Beehive Bend area that produce subcommercial quantities of gas from the "G"-1 zone. From the top of the Starkey sands to the base of the Arbuckle-Beehive Bend sands, there is a maximum total thickness of section approximating 15,000 ft.

Thus, there is a great thickness of marine sedimentary rock which has produced gas. The next question that needs an answer is "How much area remains to be explored?"

Exploratory wells average one in every 35 to 40 sq. miles and many entire townships have never been drilled (Fig. 3).

Productive Areas

The area where Eocene and Paleocene sediments are present has a maximum thickness of about 6,000 ft. All of the area is not attractive explorationwise, but most of it is.

The fields on the north—Durham, Perkins Lake, and Bounde Creek—produce from the Eocene gorge in lenticular sands on small structures. On the south, because most of the sands are of the blanket type, traps are primarily purely structural.

Two important points regarding these zones for future exploratory possibilities are: (1) A vast potential area is available for exploration, and (2) many of the early wells were bottomed in the Eocene without testing the Paleocene.

The Upper Cretaceous "Starkey" sands and equivalents have a maximum thickness of about 2,500 ft. Traps are combination structural-stratigraphic. The potential exploratory area is extensive.

Once again, as in the case of the Paleocene, many of the early wells did not fully penetrate the section. For example, in the Vernalis-McMullin Ranch area, early wells were bottomed in the upper portion of the Blewett and later wells proved the basal sands productive.

The present distribution of the Winters sands and equivalents has a maximum thickness of about 4,500 ft. Their distribution is somewhat similar to that of the Starkey sands. Recent wells at Walnut Grove, Vernalis, and McMullin Ranch have discovered large reserves in thick sections. These sands will receive considerable attention soon.

The "E" and "F"-1 zone Kione sands, which have a maximum thickness of approximately 2,000 ft., present a rather startling picture of distribution.

The most southerly production is at Sutter City, but the sands are present over most of the Valley, leaving a vast area for future exploration. Wild Goose field, producing from the Kione with maximum well depths up to 3,400 ft., has recoverable gas in the order of 100,000 M.c.f. per acre, and one well may have as much as 300 to 400 ft. of gas sand.

The economics of this target are immediately apparent, and the Kione will continue to be one of the major objectives.

The pre-Kione "F" zone sands are currently the hottest objectives in the Valley with five new-field or new-pool discoveries so far this year at Kirkwood, Grimes, Buckeye, Kirk, and Dunnigan Hills (Fig. 4).

The zone within which sands may occur has a maximum thickness of about 6,000 ft. Traps are combination structural-stratigraphic. The zone will be prospected immediately and diligently in the areas where well depths to 10,000 ft. will fully penetrate it, and it will be of great future interest in areas requiring deeper drilling such as the Delta structures.

Possible future objectives below the "F" zone have not been considered here because of the generally high

Presented before the Pacific Section, AAPG, November 3, 1960, in Los Angeles.

cost of exploring for them.

The general conclusion that may be drawn from the foregoing is that the Valley has multiple objectives that are present over extensive areas, and that it has been little explored.

Some pertinent geologic observations are:

1. Source rocks are no problem because 2½ billion M.c.f. has been produced from Valley sediments (Pliocene to "G" zone Cretaceous).

2. Porosities are commonly in the range of 25 to 35%, and permeabilities may range up to several hundred millidarcies and beyond. Compare these with the reservoir sandstones of the San Juan basin, for example, where porosities are commonly around 10%, and permeabilities in the 1-md. range.

3. Reservoir pressures are mostly hydrostatic, but over 150 pressure measurements in the "F" and "G" zones indicate that within these zones the pressure gradient approaches 1 lb. per ft. of depth.

In Arbuckle field, for example, the pressure at 6,000 ft., as a result of the high gradient in the "F" zone, may be as much as 800 lb. over hydrostatic. This can amount to an increase of as much as 170 M.c.f. per acre-foot in reserves.

4. The basin has enjoyed a mild tectonic environment. The porosities and permeabilities have not been impaired, which is important from the standpoint of both reservoir characteristics and migration paths allowing the gas to accumulate in significant pools instead of minor, hard-to-find pools.

Another favorable aspect of the mild environment is that structural interpretation is not extremely difficult, and can be resolved using subsurface correlation and geophysical methods both rapidly and accurately.

The principal geophysical method in use is the reflection seismograph. It is generally inexpensive in detailing suspected structural anomalies. The cost over much of the area may vary between $500 and $1,000 per mile of line. Most of the recent combination structural - stratigraphic trap discoveries are a result of both geophysical and subsurface geological methods.

In summary of the geologic conditions favoring exploration in the basin, I would list the thick sequence of marine rocks with good reservoir characteristics which are productive of gas and relatively little explored, and a mild tectonic environment.

Exploration Costs

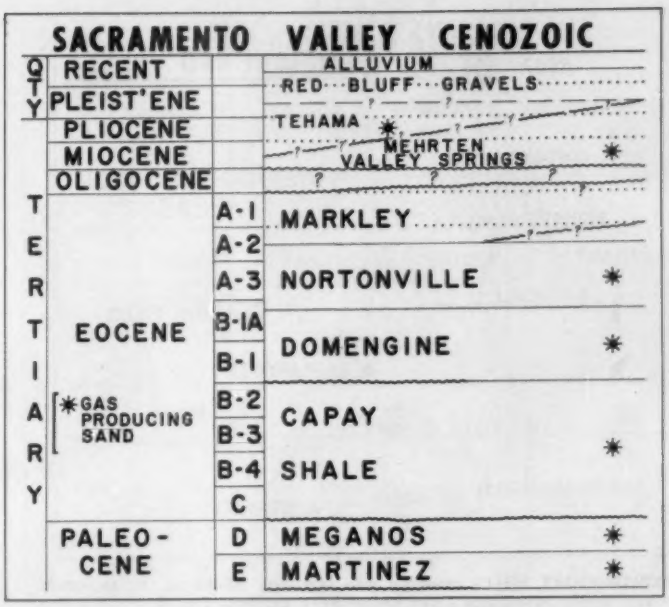
Now let's look at economics.

Land costs here are considerably below those in the oil basins of California. In areas remote from field development, the top price is $2 per acre per year with a one-eighth royalty. In areas of intense exploratory activity, such as the Colusa basin with three new field discoveries this year, $5 to $10 per acre per year with a one-sixth royalty is now common.

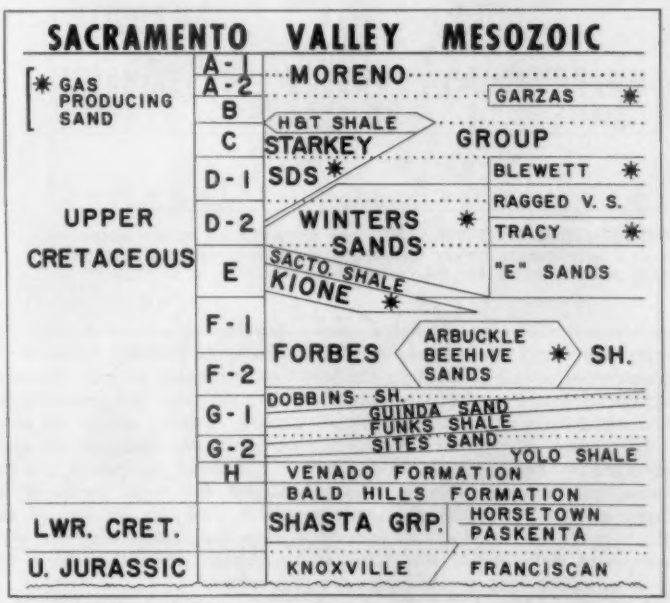
A recent survey of some 80,000 acres under lease to one operator extending from the vicinity of Vernalis on the south to northwest of Corning found an average price of $2.90 per acre per year and an average royalty of less than one-seventh.

A comparison of the penetration rates and dry-hole drilling costs (Fig. 5) shows that the drilling costs increase when penetrating the "F" and "G" zones of the Upper Cretaceous.

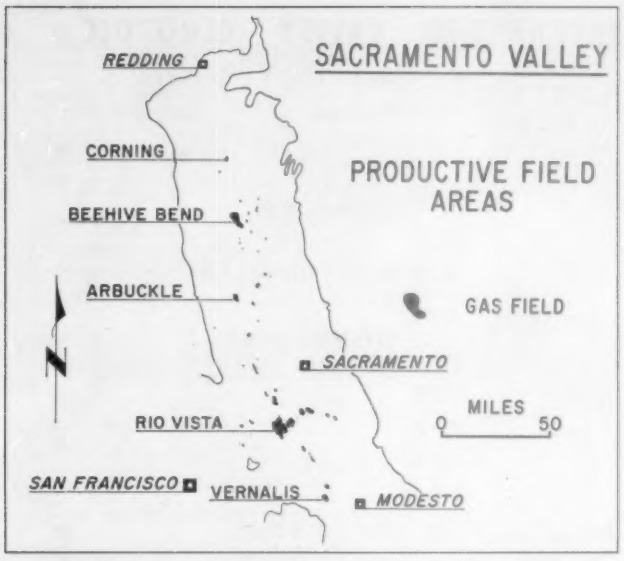
This is because of the decreased



THIS CENOZOIC SECTION of the Sacramento Valley notes the nonmarine rocks above the Eocene that produce from the Tehama at Corning, Rancho Capay, and Colusa, and from the Miocene at Vernalis. These nonmarine rocks need more exploring. Fig. 1.



ROCK UNITS in this Mesozoic through Upper Jurassic section in the Sacramento Valley are all marine. From the top of the Starkey to the base of the Arbuckle-Beehive Bend sands, there is a maximum total thickness of 15,000 ft. Fig. 2.



EXPLORATORY WELLS average one in every 35-40 sq. miles, and many entire townships have never been drilled. Fig. 3.

THE PRE-KIONE "F" ZONE SANDS are currently the hottest objective in the Sacramento Valley gas search with five new field or new-pool discoveries so far this year. Fig. 4.

penetration rate, the increased pressures previously mentioned, and the necessity of setting fairly deep surface strings to insure against lost circulation when carrying high mud weights.

In general, average well depths are expected to be above 7,000 ft. for some time to come. During the first three quarters of 1960, the average depth of all 163 exploratory and development wells drilled was 5,664 ft. It is apparent that the average dry-hole cost is less than the figures shown here, and is extremely favorable when compared to other areas.

Completion costs are quite comparable with those in other gas areas. Casing is generally either 4½ or 5½ in., cemented to well above the productive zone, and generally jet-perforated. Tubing strings are either 2 or 2½ in., depending on the casing size.

Wellhead equipment has to be designed for high pressures in some cases, and can become an expensive item that companies are pleased to purchase when they have the extra pressure.

Several dual completions and one triple have been made, but they are not common.

For a well completed in the "F" zone to depths of about 6,500 ft., an average completion, including heater and scrubber, will run about $50,000, with the total cost of the well then approaching $110,000.

Now we get to the crux of the entire study, which is, "How much can we get for our effort on a dollar and cents basis?"

A typical, conservative, volumetric estimate for an "F" zone well should result in a payout of about 2 years. This is based on a daily-minimum-guarantee basis currently in use by the purchaser.

This is, of course, only a 20-ft. sand body. For 60 ft. of productive sand under the same conditions, the net income before taxes could rise to about $2,400,000, and the payout would be in 8 or 9 months.

Here is how this payout is figured:

The depth of the sand in the typical well is 5,940-60 ft. The average recovery factor of 75% in some cases is higher as agreed with the purchaser (the 75% factor is used instead of computing recoverable gas based on an abandonment pressure). This calculates to be 3,700 M.M.c.f. of recoverable gas in place. Details are shown in Fig. 6.

At a price of 30 cents per M.c.f., the gross value would be $1,110,000. Assuming a royalty of one-sixth, drilling and completion costs of $110,000, and operating costs over the life of the well of $150 a month ($36,000 over 20 years), the undiscounted net income to the producer before taxes would be $779,000.

This amply demonstrates the value of the discoveries.

You will note that a price of 30 cents per M.c.f. was used as the price at the wellhead paid to the producer. This is the average current price paid by Pacific Gas & Electric Co. for 1 M. B.t.u. gas in the Sacramento Valley.

This compares with prices such as 13 cents per M.c.f. paid in the San Juan basin of New Mexico, 17 cents per M.c.f. paid in the Texas Panhandle, and so forth.

We need to know whether in the long-term outlook, California gas will continue to hold this competitive advantage over out-of-state sources.

In 1959, California ranked second among the states in consumption, sixth in production, and sixth in reserves of natural gas. The state actually produced only 55% of the natural gas consumed—the other 45% was transported by pipeline from out of state.

It is estimated by various groups that California's population may increase by 50% in another 20 years, with a proportionate increase in energy requirements. PG&E, which services

northern and Central California and is the sole utility purchaser of gas produced in the Sacramento Valley, estimated in testimony before the Canadian National Energy Board that, if it were allowed to import Canadian gas, it would just be able to meet the market demand expected by 1965.

It appears rather certain that the market demand will continue to rise so long as natural gas is competitive with other sources of energy such as fuel oil. In fact, many of the markets serviced by gas will continue to be serviced even at premium prices because of its convenience, cleanliness, and so forth.

To meet its demand in northern and Central California, PG&E has received authority and is joining in the building of a 1,400-mile pipeline from Alberta to the San Francisco area, at a cost of some $400,000,000. Gas purchased in Alberta for about 15 cents per M.c.f. will be delivered in the bay area for about 44 cents per M.c.f.

Herein lies the story of the competitive advantage of Sacramento Valley gas compared with the out-of-state gas; namely, proximity to market.

In hauling the gas from distant sources, approximately two-thirds of the price of the gas delivered to the San Francisco area is accounted for by pipeline amortization, transmission costs, and profit. Compare the distances involved in bringing Alberta gas and San Juan basin-Permian basin gas into California with the maximum distance of 150 miles to the same destination from the wellhead in the Sacramento Valley.

It does not seem improbable that the valley producer may receive more for his gas very soon, because there seems to be ample room for upward price movement to bring the price more in line with imported gas.

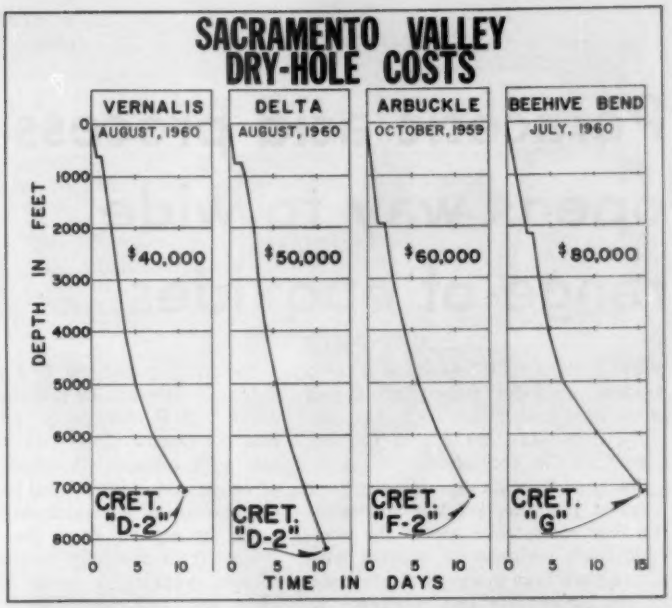
One other important economic aspect favoring Sacramento gas development is the ability to market the product. Contracts include a minimum "pay or take clause," guaranteeing the producer payment for a minimum amount daily whether taken or not. Compare this with some recent distressed situations in the crude market, where shut-in wells were the order of the day. Imported gas cannot compete with the domestic, whereas imported oil can seriously harm the domestic oil production.

As the last category for consideration, let us look at the political aspects of exploring in the Sacramento Valley.

First is the fact that the gas is sold within the state, and therefore the producer does not come under the jurisdiction of the Federal Power Commission.

Secondly, there is no governmental body that regulates production on a pro rata share basis. It is important to compare the position of the California producer with that of the producer in the prorated states. Well payouts in many states are so severely delayed by probation that on a discounted-dollar basis, the wells become uneconomic. This is compared with the generally less than 2-year payout for a Sacramento Valley well.

In summation, the favorable geologic conditions, the excellent cost and profit economics, and the nongovernment intervention, provide the incentives for a continually expanding search for natural gas in the Sacramento Valley.



A COMPARISON OF THE PENETRATION RATES and dry-hole drilling costs shows that the drilling costs increase when penetrating the "F" and "G" zones of the Upper Cretaceous. Fig. 5.

Acknowledgment

The author thanks the management of Occidental Petroleum Corp. for permission to release the information contained herein, and in particular, Richard H. Vaughan and Robert A. Teitsworth, Occidental Petroleum Corp., for their invaluable assistance in preparation of the data.

VOLUMETRIC RESERVE CALCULATION
UPPER CRETACEOUS "F" ZONE

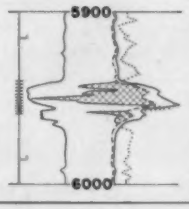
$$R = A \times t \times \phi \times (1 - S_w) \times \frac{T_s}{T_r} \times \frac{P_r}{P_s} \times \frac{1}{Z} \times K \times F$$

$$= 3{,}700{,}000 \text{ MCF}$$

GROSS VALUE $1,110,000

WHERE:

R	= RECOVERABLE GAS IN MCF	
A	= DRAINAGE AREA	= 160 AC
t	= THICKNESS OF SAND	= 20 FEET
ϕ	= EFFECTIVE POROSITY	= 25 %
S_w	= WATER SATURATION	= 40 %
T_s	= STANDARD TEMPERATURE	= 520°A
T_r	= RESERVOIR TEMPERATURE	= 573°A
P_s	= STANDARD PRESSURE	= 14.73 psia
P_r	= RESERVOIR PRESSURE	= 3345 psia
Z	= COMPRESSABILITY FACTOR	= 0.873
K	= MCF IN ONE ACRE FOOT	= 43.56
F	= RECOVERY FACTOR	= 75 %



A TYPICAL VOLUMETRIC ESTIMATE for an "F" zone well should result in a payout of about 2 years. Fig. 6.

D. H. STORMONT
Refining Editor

Peracetic acid process opens way to wide range of epoxides

HOW PERACETIC ACID is used to produce epoxides from olefins and other unsaturated materials was partially unveiled by Union Carbide Chemicals Co. recently.

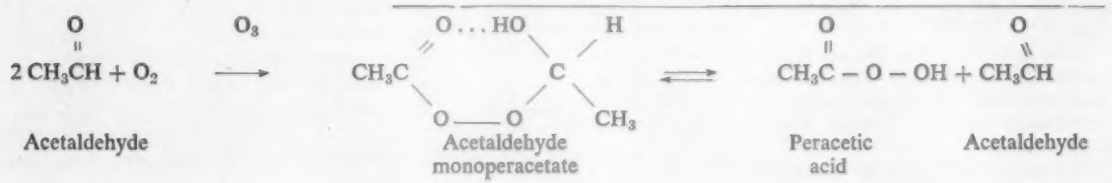
Its new 10-million-pound per year plant at Institute, W. Va., represents the first commercial use of the peracetic route. Almost all epoxies heretofore have been made by the reaction of epichlorohydrin and bisphenol A.

Of particular interest are the unusual safety measures taken in handling the highly reactive, potentially explosive acid (OGJ, Aug. 1, 1960, p. 134). An intermediate compound, acetaldehyde monoperacetate (AMP), likewise is highly unstable and requires extraordinary precautions.

Heretofore the only type of peracetic acid available was that made by reacting glacial acetic acid with 90% hydrogen peroxide. The product is a 40% solution containing water, hydrogen peroxide, and acetic acid. These impurities prevent the peracetic acid from being used in epoxiding reactions as they usually cause destruction of the product catalyzing ring-opening reactions.

High purity of the peracetic acid produced by the UCC process makes it useful for the preparation of a wide variety of improved epoxides. They do not color in sunlight, can be cross-linked to provide very high-temperature strengths, and have viscosities generally lower than those of conventional epoxies, UCC claims.

Synthesizing peracetic acid. In the unique plant at Institute, acetaldehyde is autoxidized to peracetic acid in a two-step process. The AMP formed in the first stage decomposes to peracetic acid and acetaldehyde. Equations for the reactions involved are as follows:

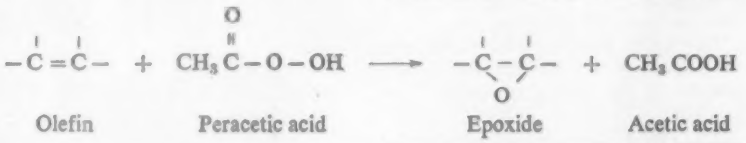


In carrying out the first step (see diagram), temperature is maintained at about 32° F. Air, or oxygen, is fed into the reactor along with ethyl acetate as a dilutent. A small quantity of ozone also is introduced to catalyze the reaction of acetaldehyde to AMP.

In the second stage the AMP is subjected to carefully controlled pyrolysis, breaking it down into peracetic acid and acetaldehyde. These two products then are quickly separated to prevent interaction. The peracetic acid is recovered as a 30% solution in ethyl acetate. Excess ethyl acetate and the remaining acetaldehyde are run to a recovery system, from where they are recycled back to feed.

Producing epoxides. In the second section of the plant, peracetic acid solution is reacted with various olefins to make a wide variety of epoxides. In its original pilot-plant investigations, UCC made more than 800 epoxides. Initially it is concentrating on six which show the greatest promise.

In this synthesis, the general reaction involved is:



Of the epoxies being produced, one popular diepoxide is UCC's Unox Epoxide 201 (a dicyclic diepoxy carboxylate). Details of the process have not been released but the original planned procedure was along these lines:

Peracetic acid is reacted with a cylic diolefin, produced elsewhere at Institute in a two-step process starting with butadiene and crotonaldehyde.

As shown in the flow diagram, the acid and diolefin are fed into two agitated reactors in series. Approximately a 90% conversion is accomplished in the first stage and complete conversion attained in the second. As the rapid reaction results in considerable heat being released, cooling is needed to hold the temperature to about 140° F. To assure that all olefin is converted, excess acid is used.

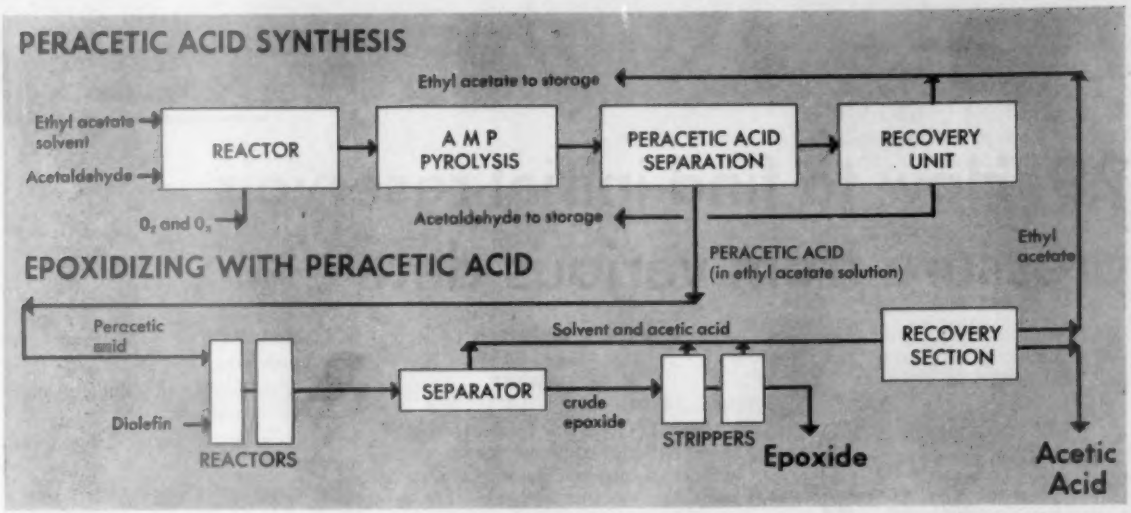
From the reacting section the epoxide-acetic acid-solvent mixture goes to a heat exchanger where its temperature is raised to approximately 212° F. It then passes to a 22-ft.-high stainless-steel packed tower, operated at about 20 psig. Solvent and acetic acid are flashed overhead and crude epoxide removed from the bottom.

Temperature of the crude epoxides is again raised to about 212° F. in another heat exchanger, after which it goes to two stripping columns. In the first, operated at a relatively high vacuum, almost all contaminating acetic acid and solvent are removed. In the second stripper, operated at a still higher vacuum, remaining traces of these materials are driven off. Gradual decomposition of the epoxide occurs if all acetic acid is not removed.

The pure bottoms product from the second still is first cooled to approximately 100° F., after which it is run through a pressure filter. This temperature is maintained during filtration, and after the epoxide is stored, so that it can be readily handled.

From the above discussion it is seen that the peracetic acid is only an intermediate in the manufacture of acetic acid. For each mole of acetaldehyde originally consumed in the process, one mole of acetic acid is obtained as a byproduct. In the epoxidation phase of the process, therefore, net raw material consumption consists only of the diolefin and oxygen.

Safety considerations. During the peracetic-acid manufacturing stage, product purity is closely checked. This is necessary as certain contaminants,



PERACETIC ACID SOLUTION is reacted with various olefins, in the second section of this plant, to make a wide variety of improved epoxies.

particularly ions of heavy metals such as cobalt, iron, and copper—can act as catalysts and result in violent decomposition of either the AMP or peracid. Use of ethyl acetate as a diluent minimizes the hazard.

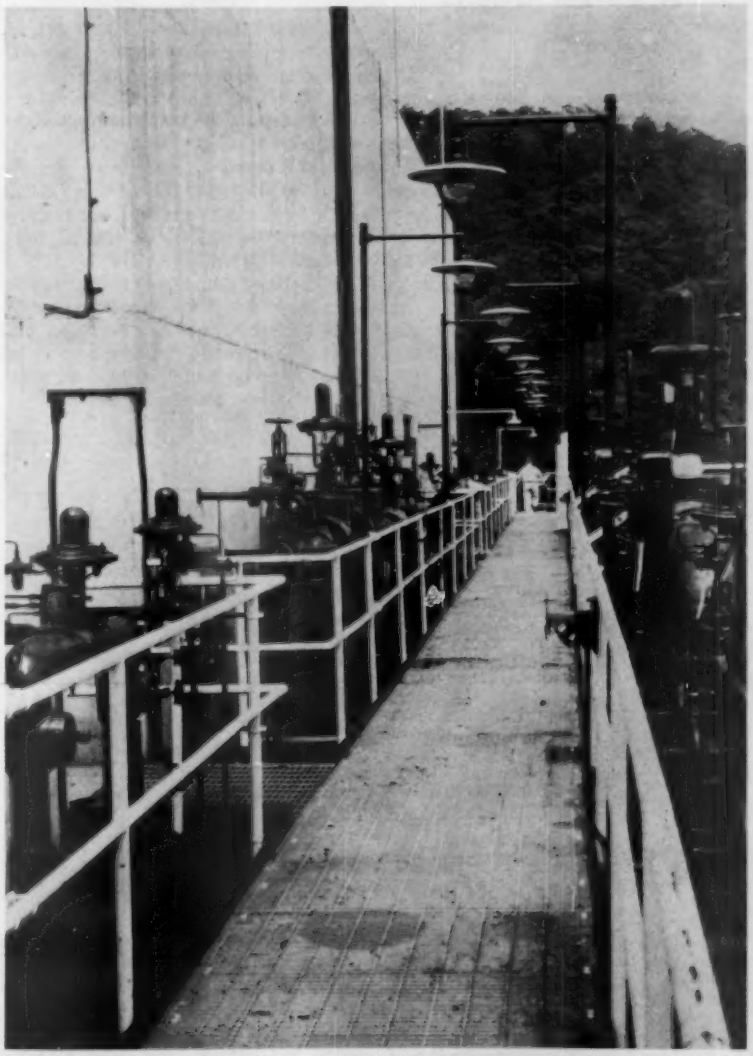
As the unstable peracetic acid can't be stored, it must be used in the epoxide unit as fast as it is produced. A power failure thus could cause considerable difficulty.

To minimize this possibility, dual power cables are provided. Each is fed from an independent source. In the event a shutdown becomes necessary, the hill-side location of the plant permits emergency dumping of all tanks and vessels to a water-filled flare pit below the plant.

Various process stages of the peracetic plant are isolated from one another by thick concrete walls. Open side of the three-walled cells faces into the hill. Thus the force of any explosion would be directed away from the control room, located some 100 ft. downhill from the plant. Controls for making manual adjustments on instruments are located outside the cells.

Manufacturing operations are mainly regulated from the central control room. Various instrument interlocks are provided to prevent unsafe conditions being created. More than 50 alarm circuits are provided to indicate unsafe operations.

In adidtion to its Unox 201, other epoxides being produced by Carbide at Institute include Unox 206 (vinylcyclohexene dioxide) and Unox 207 (dicyclopentadiene dioxide). Epoxy plastics based on the former can withstand temperatures above 570° F., and the latter is characterized by its extremely low viscosity. Another product is an epoxidized soybean oil (Flexol plasticizer EPO).



CATWALK IS LINED WITH MANUAL CONTROLS which duplicate automatic controls located in remote control room. Shielded from process equipment by reinforced concrete, operators can regulate the process reactions from this catwalk in complete safety.

29. How to find initial reservoir pressure from various data

BY E. T. GUERRERO
and
F. M. STEWART

GIVEN: Pressure and production data for a drill-stem test taken from the first well drilled in a pool.

Time after shut in, minutes Θ	Bottom-hole pressure, p, psia.	$\frac{t_o + \Theta}{\Theta}$
1.0	2,735	46.0
2.0	2,746	23.5
3.0	2,750	16.0
7.0	2,757	7.4
12	2,762	4.8
20	2,766	3.3
32	2,769	2.4

t_o = time drill-stem tool was open = 45 minutes

p_{ws} = static bottom-hole pressure or reservoir pressure = 2,775 psi.

D = depth to middle of formation tested = 6,110 ft.

ρ_w = average density of brine or gradient for area in which well is located = 0.450 psi. per ft.

FIND: Initial reservoir pressure obtained by measurement, pressure buildup data, and from hydrostatic gradient.

METHOD OF SOLUTION: Horner's[1] basic buildup equation for a single well in an infinite reservoir applies in this case.

$$P_w = p_i - \frac{162.6\, Q_o\, \mu_o\, B_o}{k_o\, h} \log \frac{t_o + \Theta}{\Theta} \quad (1)$$

When using the hydrostatic gradient method:

$$p_{ws} = D\, \rho_w \quad (2)$$

Where: Θ, p_{ws}, t_o, D, and ρ_w were defined with the data, and

p_w = sand face or bottom-hole pressure at Θ time after shut-in, psi.

p_i = initial reservoir pressure, psi.

Q_o = constant production rate at mean reservoir conditions before shut-in, stock-tank barrels per day.

μ_o = viscosity of oil at mean reservoir conditions, cp.

B_o = oil formation volume at mean reservoir conditions.

k_o = effective permeability to oil, md.

h = net sand thickness, ft.

SOLUTION: Since Q_o, μ_o, B_o, k_o, and h are assumed constant during the test, Equation 1 can be written as

$$p_w = p_i - m \log \frac{t_o + \Theta}{\Theta}$$

Where:

$$m = \frac{162.6\, Q_o\, \mu_o\, B_o}{k_{oh}}$$

This relation is the equation of a straight line resulting from plotting $(t_o + \Theta)/\Theta$ vs p_w on semilogarithmic paper with $(t_o + \Theta)/\Theta$ on the log scale. Since this is true, m is the slope of the straight line and p_i the ordinate intercept. The factor $(t_o + \Theta)/\Theta$ is shown with the given data. In Fig. 2 it has been plotted against the bottom-hole pressure (p_w). Thus the ordinate intercept in Fig. 2 is

$$p_i = 2{,}777 \text{ psi.}$$

Fig. 1 shows a typical pressure-time chart for a satisfactory drill-stem test. The D value shows that the tool was allowed to remain shut in long enough for the pressure to build up to static conditions. Under such conditions the original reservoir pressure is measured directly and in this case was

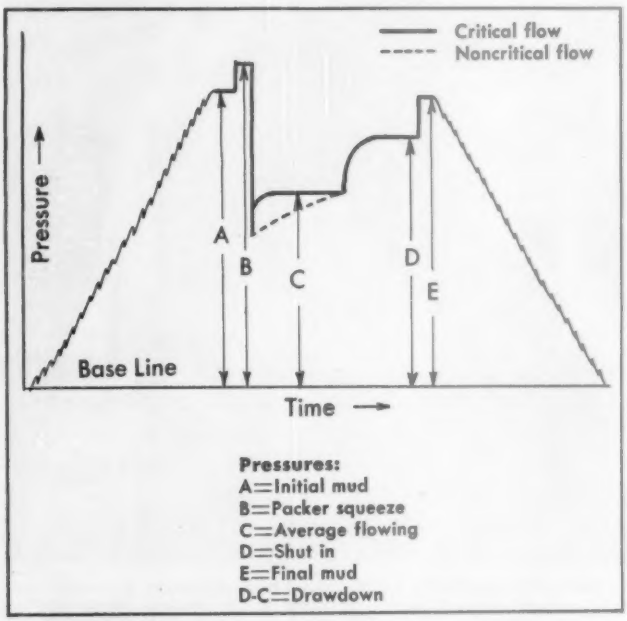
$$p_i = p_{ws} = 2{,}775 \text{ psi.}$$

Equation 2 gives the pressure exerted by a column of fluid of height D and having an average density of ρ_w. Therefore

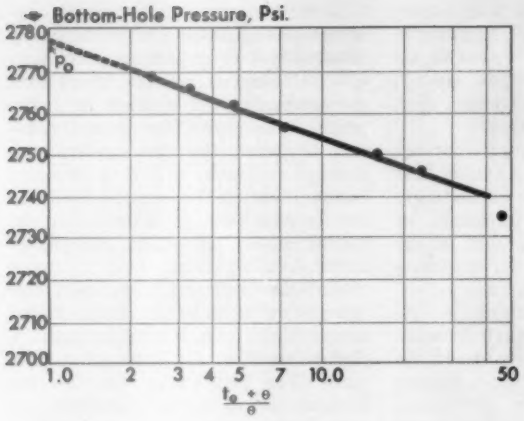
$$p = p_{ws} = (6110)\,(0.450) = 2{,}750 \text{ psi.}$$

DISCUSSION:

Of the many factors that are involved in reservoir-engineering problems, perhaps none is as important or as much used as reservoir pressure. It is indicative of reservoir energy and



TYPICAL CHART for a satisfactory pressure test. Fig. 1.



PRESSURE-BUILDUP CURVE from drill-stem test data. Fig. 2.

is needed in finding and correlating fluid properties such as solution gas-oil ratio, formation-volume factors, viscosity, and compressibility. Good pressure histories are vital, beginning with the initial reservoir pressure. This problem shows three ways to find this factor. The most accurate, and the most used, is direct measurement with a subsurface pressure gage. However, such an approach requires that the measurement be made on discovery of a pool, as production will cause the pressure to decline.

Here the assumption is made that sufficient shut-in time was allowed for the pressure at the sand face to build up to initial reservoir conditions. If there has been any appreciable production from the well, and to insure against error, it is recommended that at least two measurements be made on the well with an intervening time of several hours to a day until identical maximum readings are obtained. Also, it is advisable that more than one of the original wells be tested.

Occasionally the pressure in a well is not given enough time to build up to static conditions. The permeability of the formation or zone being tested may be so low that, as a practical matter, the time required for complete buildup is too long for continuous or spot measurements until actual buildup is achieved. Under such conditions a pressure-buildup test can be used to determine the initial reservoir pressure. The application and theory of this method were covered in Part 13[2] of this series. This problem uses the same concepts but obtains the necessary data from a drill-stem test.

Pressure buildup is shown in Fig. 1 between pressures c and d. It is from this interval that data such as those given and used in Fig. 2 are obtained.[3,4] Recommended procedures in drill-stem testing necessary for obtaining good presssure-buildup data have been presented by Black[4] and Dolan, et al.[3] Such data are not only useful in determining initial reservoir pressure but also for evaluation of formation damage[3] at the well bore.

Use of a hydrostatic gradient to determine initial reservoir pressure results in a reasonable estimate when experience in the area has made possible the development of an average hydrostatic gradient. In a large number of areas the hydrostatic gradient will lie between 0.433 to 0.470 psi. per ft.[5] The range is caused by a variation of dissolved salts content. Gradients lower and higher than these are generally considered abnormal and may be caused by hydrodynamic conditions, compaction of loosely consolidated rock, and precipitation of crystalline minerals in a closed system.[5] As a result of all these factors, this method of determining initial reservoir pressure is the least reliable of the three used in this problem. However, it is valuable as a means of rough-checking results from the other methods or for those cases where actual or reliable pressure measurements are not available.

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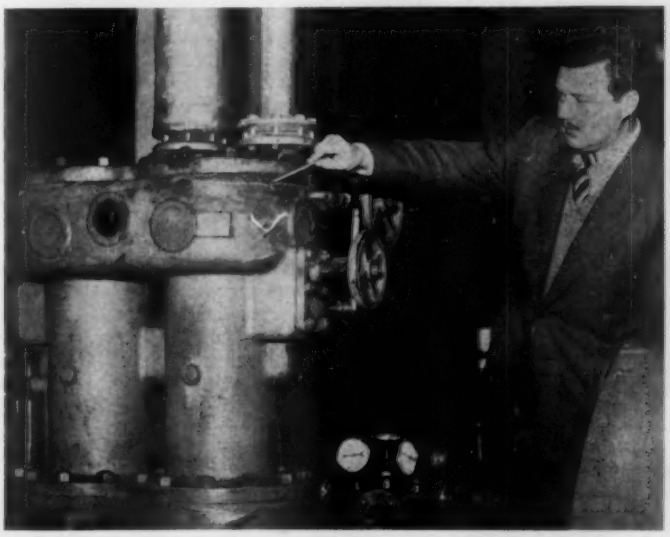

$11.20 repair job saves $1,300

The cracked water-jacket casing of an ammonia compressor was repaired recently for only $11.20. Rance, Colly & Co. (Pty.) Ltd., Johannesburg, South Africa, which performed the repair with Plastic Steel, a modified epoxy, estimates the repair saved $1,300 in labor and materials and considerable down time.

The modified epoxy, composed of 80% powdered steel and 20% plastic, is mixed with hardener just before using. Applied with a putty knife, it cures without heat or pressure into a solid mass that can be machined.

Compressors in oil refineries can be repaired in the same way, according to Devon Corp., the manufacturer.

How to save on your oil and gas estate taxes

. . . Be informed. And be sure that your appraisals are based on facts and data

W. HARLAN ECHOLS
Petroleum Engineer and
Oil and Gas Consultant
Longview, Tex.

MANY PEOPLE, faced with estate-tax problems where an appreciable portion of the assets is vested in oil and gas-producing properties, are not taking advantage of the avenues open for legal reduction of taxes.

Every possible opportunity for tax reduction should be explored and used, whether assets are in the form of royalty, production payments, or working interests. Every cent of tax money saved stays in the taxpayers pocket, and is 100% profit.

Unless those representing an estate go before the Internal Revenue Service with some knowledge of the actual worth of oil and gas-producing properties, the assessed or agreed values may result in excessive estate taxes, and the devisees pay tax on future income in excess of that which might have been established upon an acceptable reserve estimate.

Frequently, estate-tax returns are filed with low appraised values and little or no supporting data, hoping to have the values accepted through negotiation or influence, and, if these values are challenged, the IRS agent is accused of being arbitrary. Actually, the IRS agents want and are responsive to all of the supporting data the taxpayer will submit.

The information offered herein is not new, and is known by most of those engaged in handling estate-tax matters, though its use is not as generally accepted as it might be. Possibly this is because many feel the expense of a reserve estimate is prohibitive, or, that ascertaining annual production figures is too troublesome.

However, the cost of an engineering report, a deductible administrative expense, in many instances is easily justified through the tax savings effected, and since the statements accompanying payments show both production and income, these two items can be posted to a ledger simultaneously as the monthly payments are received. Also, an engineering evaluation apprises the devisees of the fair market value of the properties, a consideration which might prove most useful, especially in weighing the advisability of selling in the event an offer to purchase is made.

Ground Rules

These definitions aid in understanding the problem:

1. "Market value" is usually defined as being "the amount a willing buyer will pay a willing seller on the date in question."

2. For practical purposes, the actual worth of an oil or gas-producing property is no greater than it can reasonably be expected to return over its remaining economic life.

3. A realistic and acceptable reserve determination can be made on most oil and gas-producing properties.

4. All interest owners in oil and gas properties are entitled to a depletion allowance. The present statutory depletion, sometimes called percentage depletion, is 27½% of gross income, but not to exceed 50% of net income. Or, depletion may be computed on an actual cost basis, called cost depletion.

5. The depletion allowance, frequently referred to as depletion income, under either basis becomes a deductible item for income-tax purposes. The justification for this deduction is explained elsewhere in this article.

6. If cost depletion is used, it must be established for a unit of production, that is, upon the cost of each barrel of oil or each M.c.f. of gas, and is the quotient obtained by dividing the cost of a producing property by the estimated recoverable reserves, or by dividing the remaining cost by the remaining reserves.

7. The value assessed or agreed upon in an estate-tax return for any producing property constitutes a basis for establishing a cost-depletion schedule for future income, just as if the property had been purchased in an arm's-length transaction.

8. In those states having or recognizing community-property laws, cost depletion, based upon the agreed values in an estate-tax return, can likewise be used as to the undevised interest of the surviving spouse in these instances: (1) if the entire interest was the community property of husband and wife, or (2) if the entire interest was the separate property of the deceased husband. In the event of the wife's death, and the interest in question was her separate property, the stepped-up basis does not apply.

Under the applicable situations, this means that if the value assessed a property, when divided by the estimated recoverable reserves, results in a higher depletion allowance than the statutory 27½%, the future income from the entire interest is entitled to the more advantageous depletion allowance, including the interest of the surviving spouse, which was not devised and on which no estate tax was paid.

Estate-Tax Liability

An estate created by a decedent is immediately liable for estate taxes on the aggregate market value of the real and personal property in excess of the present $60,000 exemption for separate property, or $120,000 in case of community property. There is no question as to the value of cash

in an estate, and that of stocks and bonds (except the securities of closely-held corporations) is as easily determined by the traded value on the date the estate is created. However, the value of real property, including oil and gas interests, must be appraised.

These "appraised values," unless supported with acceptable and convincing data, usually come under rather close scrutiny by Internal Revenue Service agents, with the assistance of experienced real-estate appraisers, timber estimators, petroleum engineers, etc., all working within the IRS.

An estate-tax return is not required if the gross value of the estate is less than the applicable exemption, though if the assets can reasonably be expected to approach the amount of the exemption, appraised values are necessary to determine if any tax liability exists. Under certain conditions, the appraised values of the oil and gas interests, if based on an acceptable reserve determination, may afford a basis for the more desirable cost-depletion schedule although no estate taxes were paid thereon.

Market Value

The customary yardstick for appraising property for estate tax purposes is that of "market value." Actual sales provide a sound basis for determining market value, and IRS agents check the county clerk's records for sales of property of the same or approximate value and determine the sale price by: (1) the consideration recited in the assignment, (2) inquiry of the principals, or (3) using the value delineated by the documentary stamps affixed thereto.

Still another source for determining the sales price is the familiarity of IRS agents with the tax returns of other taxpayers who will be making sales in the area, and occasionally this can be fairly devastating.

"Market value is usually defined as being 'the amount a willing buyer will pay a willing seller on the date in question.'"

In the absence of satisfactory information of this kind, the market value of oil and gas property is frequently determined upon a "payout" basis. The average monthly return for a preceding period, usually 6 to 12 months, is extended to some longer period of time of from 60 to 150 months, depending upon an estimate of the economic life of the property. Under appraisals so determined, the estate is often assessed values which result in excessive estate taxes. The devisees pay income tax on future income in excess of that which might have resulted had the taxable values been negotiated upon the estimated recoverable reserves.

A market value in excess of the actual worth of a producing property is meaningless to a taxpayer who does not contemplate selling, and will actually redound to his disadvantage if faced with the payment of taxes based upon the higher value. Often oil and gas properties are sold at prices far in excess of their actual worth, and if such sales are used as a yardstick for establishing market prices for properties in an estate-tax return, the estate pays an excessive tax.

To avoid being saddled with a clear-cut market value in excess of actual worth, wherein the IRS has knowledge of the recent sale of an interest out of the same or similar property, two means of reducing taxes are opened up if the taxpayer offers an acceptable reserve determination:

1. Reduction of the agreed values, thus reducing the initial payment of estate taxes, or
2. Affording a basis for an advantageous cost-depletion schedule. The devisees of the estate can recoup the excessive estate tax through additional depletion income on future production.

Cost Depletion vs. Statutory Depletion

Depletion is the key to the advantageous handling of taxes in estates involving considerable oil and

TABLE 1—COST DEPLETION VS. STATUTORY DEPLETION ON WORKING INTEREST IN GAS-PRODUCING PROPERTY

Assumption under these conditions: Eight well zones, producing 54,000 M.c.f. per month, and gas selling for 14 cents per M.c.f. (residue gas plus liquids, before production tax).

(1) Interest owner	(2) Decimal interest	(3) Annual production (M.c.f.)	(4) Annual income	(5) Value based upon 80 months	(6) Reserves (M.c.f.)
100% lease	1.000000	5,184,000	$725,760	$4,838,424	67,500,000
John Doe, working interest	0.101300	525,139	73,519	490,132	6,837,750

Cost depletion on John Doe working interest (Col. 5/Col. 6) $= \frac{\$490,132}{6,837,750} = \$0.07168/M.c.f.$

Annual cost-depletion income (525,139) ($0.07168) = $37,642
Annual statutory depletion income (27.5%) ($73,519) = 20,218

Additional annual depletion income under cost depletion = **$17,424**

TABLE 2—COST DEPLETION VS. STATUTORY DEPLETION ON ROYALTY INTEREST IN OIL-PRODUCING PROPERTY

Assumptions under these conditions: 55 wells producing 400 bbl. per month each, and oil selling for $3.25 per barrel (before production tax).

(1) Interest owner	(2) Decimal interest	(3) Annual production (bbl.)	(4) Annual income	(5) Value based upon 100 months	(6) Reserves (bbl.)
100% lease	1.000000	264,000	$858,000	$7,150,000	4,400,000
Joe Brown, royalty interest	0.125000	33,000	107,250	893,750	550,000

Cost depletion on Joe Brown royalty interest (Col. 5/Col. 6) $= \frac{\$893{,}750}{550{,}000} = \$1.625$/bbl.

Annual cost-depletion income (33,000) ($1.625) = $53,625
Annual statutory depletion income (27.5%) ($107,250) = 29,494

Additional annual depletion income under cost depletion = $24,131

gas interests. Under our present tax regulations, all income-producing capital assets are allowed depreciation. For instance, the purchaser or builder of an office building is permitted to deduct from the annual rental income a percentage of the cost of depreciation. This depreciation is continued until the owner has recovered the entire cost of the building.

However, after a building, or any other comparable capital asset, has been completely depreciated, it still has appreciable income earning value remaining, depending somewhat upon the deligence of the owner in maintaining it. Conversely, when an oil or gas property is depleted, its capacity to produce additional income ceases.

The depletion of oil and gas-producing properties is nothing more than the term applied to the depreciation of this particular type of income-producing asset. The difference in terminology is necessary because the production of oil and gas results in the depleting of this capital asset—with the withdrawal of each barrel of oil or each M.c.f. of gas, the reserves are reduced by that amount—with the result that when the economic limit is reached, a property is abandoned as valueless.

When an interest in an oil or gas property is acquired, the owner is entitled to depletion income, either upon the statutory basis of 27½%, or upon the actual cost basis, and, as a matter of law it is mandatory that the owner must take the higher basis. However, without an acceptable reserve determination upon which to prepare a cost-depletion schedule, the statutory basis becomes applicable, with the result that the owner may find his property depleted before he has recovered the cost of the property through "depreciation" at the rate of 27½% each year.

Tables 1 and 2 illustrate the calculations of cost depletion and statutory depletion in two situations wherein cost depletion accrues to the taxpayer's advantage. A careful study of these two figures will clarify the computation of depletion income under both bases of depletion, and will materially aid in the understanding of this presentation.

"The depletion of oil and gas-producing properties is nothing more than the term applied to the depreciation of this particular type of income-producing asset."

When to Use Cost Depletion

Cost depletion has these two basic advantages over statutory depletion: (1) it can be more flexibly carried forward or backward as a loss, and (2) cost depletion is not limited to 50% of net income. It is apparent that these two advantages would be particularly applicable as to working interests having appreciable operating expenses.

TABLE 3

(1) Appraisal basis, months	(2) Est. economic life: Months	Years
20	72	6
40	145	12
60	216	18
80	288	24
100	360	30
120	432	36
140	504	42
160	582	48

Break point. Table 3 shows the breaking point at which the use of cost depletion may be advantageous over statutory depletion. If the appraised value is fixed upon the number of months shown under Column 1, the period of time shown under Column 2 will be required to return the cost at the statutory depletion rate of 27½%.

This means that whenever an oil or gas property is appraised at a "market value" based upon the extension of income to the appraisal basis shown under Column 1, and the economic life can be reasonably expected to be less than the corresponding figure shown under Column 2, the use of cost depletion will re-

sult in an increase in future tax deductable income.

For instance, if market value is based upon 80 months and the estimated life is actually only 15 years under a reserve estimate, to convert to cost depletion will result in approximately 60% more depletion income each year to abandonment. And in considering this additional depletion income, do not overlook the fact that, if applicable under those previously explained situations, the undevised portion of the surviving spouse's interest, on which no estate tax was paid, is entitled to the more desirable cost-depletion rate.

There is continuing agitation to reduce the statutory depletion allowance to some figure less than the present 27½%, with many of the proponents of this move advocating a reduction to 15%. If and when there is a reduction in the percentage depletion, owners of oil and gas interests should examine all unusual situations they may have as to the possibility of improving their tax position by converting future depletion income to a cost basis.

Revising the Basis

Though values have been agreed upon, the estate tax paid, and the estate closed so far as the Internal Revenue Service is concerned, the taxpayer can at a later date make a request to revise the basis for taking cost depletion, or convert the cost depletion though statutory depletion has been previously used. But the originally agreed upon values must always remain as the starting point for conversion to or revision of the basis for taking cost depletion.

The reasons for reconsideration by the taxpayer may be several, among which may be: (1) some unforeseen changes in reservoir performance which materially alter the previously submitted reserves, (2) absence of sufficient reliable data upon which to base reserves at the time the values were agreed upon, or (3) the agreement of values without the benefit of any reserve determination.

To initiate a request for reconsidération, a new or revised reserve determination is prepared and submitted to the Internal Revenue Service for review and acceptance. If the request is made prior to the running of the statute of limitation (within 3 years after filing the estate-tax return), the revised basis can be made retroactive to the time the estate was created.

The reserve figure is used as the divisor and the agreed value the dividend of a fraction, the quotient of which establishes the cost per unit of production. If the request is made after the running of the statute of limitation, this computation is made: the agreed values, less the previously allowed depletion income to the requested date of revision, is used as the dividend and the reserves, as of the corresponding date, the divisor of a fraction, the quotient of which establishes the cost per unit of production. This fixes the basis for cost depletion subsequent to the date of the revision. The depletion income for any tax period is the product of the production had during such period times the previously determined cost per unit of production.

Conclusions

An effort has been made to be technically correct in all instances where there is an implied interpretation of the Internal Revenue Tax Code. But facts alter situations, and the tax code must be interpreted in the light of existing state laws. So wherever there is any possible misunderstanding, it is suggested that advice be sought of a well-informed tax consultant.

A prominent football coach ascribes to the proposition that "a good offense is the best defense," and the writer's experience dictates this to be equally effective off the athletic field—the taxpayer is able to take the offensive when he submits appraisals soundly based upon facts and data.

If this presentation stimulates some thinking away from the practice of trying, often unsuccessfully, to defend blindly estimated appraisals, and, to impart the realization that depletion income can sometimes be advantageously determined upon a basis other than the statutory 27½%, this writing effort will have been justified.

BOOKS

ASPHALTS AND ALLIED SUBSTANCES, VOLUME ONE. By Herbert Abraham. Published by D. Van Nostrand Co., Inc., 120 Alexander Street, Princeton, N. J. 370 pp. $10.75.

This is a volume written for those interested in the fabrication, merchandising, and application of bituminous products.

Included is a brief historical review along with terminology, classification and the chemistry of bituminous substances, and extensive coverage of the natural raw materials. The geographic locations of known asphalt deposits throughout the world are listed and methods of mining, transporting, refining, and storing them are outlined.

OIL AND PETROLEUM YEAR BOOK. Compiled and published by Walter E. Skinner, 20 Copthall Avenue, London, E.C.2, England. 972 pp. $7.

This is the fifty-first annual publication of this directory, which includes comprehensive listings of oil companies throughout the world, an international buyers' guide, a managers, engineers, and agents section, a crude-oil and natural-gas table for world production, as well as two new features—a map and a chart.

The map illustrates global oil supply and demand for 1959, and the charts shows product demand by end use, U.S.A. and Europe, 1959.

USES OF ELECTRICITY IN THE OIL INDUSTRY. Edited by E. A. Reeves. Published by John de Graff, Inc., 31 East Tenth Street, New York 3. 296 pp. $10.

This book, the editor explains, is not intended to be so much a text book as a reference book. It details the practices adopted by British oil companies in regard to electrical practices in the industry. One chapter does, however, show where these differ from Continental European and North American practices.

Preliminary chapters concern safety codes in the industry, and the importance of flameproof equipment.

Electricity in distribution depots and marketing installations forms the content of another section.

One section is devoted to power generation and distribution in a refinery.

Another part is devoted to more general subjects.

THE PHYSICS OF FLOW THROUGH POROUS MEDIA. By Adrian E. Scheidegger. Published by MacMillan Co., 60 Fifth Ave., New York 11. 313 pp. $15.50.

Here in one volume is information on the physical principles of hydromechanics in porous media.

A number of topics are presented here for the first time in book form: There is a complete discussion of the past and present physical theories of flow through porous media, including a theoretical deduction of Darcy's law, a critical evaluation of the Kozeny theory, and a presentation of statistical flow theories. The book expounds the theory of the advance of a saturation front in the displacement of a fluid in a porous medium by another which is immiscible with the first, and gives a complete theory of displacement of a fluid in a porous medium by another which is miscible with the first. It outlines methods for solutions of flow problems for turbulent flow, molecular flow, and flow with adsorption, in addition to reviewing briefly the standard methods applicable to cases where Darcy's law is valid.

MATERIAL CLASSIFICATION MANUAL, 1960. Published by Ross-Martin Co., P.O. Box 800, Tulsa. 45 pp. $3.

The Petroleum Accountants Society of Oklahoma has sponsored the publication of this volume, a revision and recompilation of a 1953 edition. Its purpose is to show oil-industry accountants the depth of current account control, depth of inventories, and depth of settling inventory differences on joint-interest operations.

It provides a medium for uniform handling of material and equipment in joint-interest operations that are subject to record control, inventory, and adjustment of overages and shortages.

The text presents an alphabetical item list of material and equipment used in the petroleum industry, together with the recommended accounting treatment for the express purpose of facilitating the reconciliation of material records with joint inventories prepared in accordance with applicable operating agreements.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

The FOREMAN'S PAGE

This article begins a new series on

Principles of combustion

EVERY chemical reaction involves heat. If heat is given off, the reaction is said to be exothermic; if absorbed, endothermic. When the object of reaction between oxygen and another substance is to obtain the heat of reaction, that substance is called a fuel. This reaction, which is accompanied by heat and light, is called combustion.

To have combustion we must have the proper ignition temperature. A simple example is the lighting of a match. Fuel and air are present, and the heat or ignition temperature required to ignite the match head is obtained by friction. The matchstick ignition temperature is reached by burning the match head. Of course, the burning match can then be used to ignite another fuel.

Byproduct gases and liquid fuels are burned at practically all major process units to get the necessary heat to carry out the processes.

Fuel cost is a major part of the operation cost at a refinery. It is therefore important to run refinery furnaces in the most efficient manner possible. To do this it is necessary to understand the basic principles of why fuels burn, what types of equipment are used, and how to best use this equipment.

Fuels

Fuels are classified as primary if they are used as found in nature. Wood, coal, and natural gas are examples. Secondary fuels are those which must be processed to put them into the desired condition for burning. Byproduct fuels produced from process operations are secondary fuels.

Three basic types of fuel are burned in most furnaces: (1) gas, (2) low-viscosity fuel oil, and (3) high-viscosity fuel oil. Each of these fuels has its own peculiar properties, and therefore each requires different handling.

Gases. Gases burned in refinery furnaces are byproducts which come from crude-distillation, thermal, and catalytic cracking units. These gases are eventually released into what is called a burning line. Gas is then withdrawn from this line for burning in various refinery furnaces.

Byproduct gas is the easiest fuel to burn because it contains no solids, does not require pumping, and can be easily regulated and mixed with air. However, it has become, in general, uneconomical to burn because of the increasing use of byproduct gases for product manufacture. It is generally worth more money to the refinery to recover this gas than it is to burn it.

The heating value of an average fuel gas is about 1,500 B.t.u. per cu. ft.

Low-viscosity fuel oil. The more common name for low-viscosity fuel oil burned in refinery furnaces is Bunker C. Its properties are:

Viscosity—175 to 300 S.s.F. at 122° F.

Specific gravity—1.01 to 1.03.

Heating value—18,500 B.t.u. per lb.

This fuel can be pumped at temperatures above 100° F.

High-viscosity fuel oil. Properties of high-viscosity fuel oil are:

Viscosity—100 to 500 S.s.F. at 275° F.

Specific gravity—1.1.

Heating value—17,500 B.t.u. per lb.

Although high-viscosity fuel oil is the cheapest of the three fuels to burn, it is the most difficult to handle. Because of its high viscosity, it is necessary to keep this fuel at 400° to 600° F. to prevent line or equipment plugging. High-viscosity fuel oil is essentially the pitch bottoms from crude oil from which the last traces of lighter boiling fractions have been removed.

Combustion Mechanism

With the exception of carbon, all fuels burn as a vapor.

Some materials burn more rapidly than others, and, in general, this readiness to burn depends upon how easy it is to turn the particular substance into a vapor. Most liquid fuels are not readily vaporized, and the burning system must provide the means to vaporize them. The system must also supply the proper amount of oxygen to support combustion.

In refinery furnaces, air provides the oxygen. Air is 21 vol. % oxygen and 79 vol. % nitrogen. Nitrogen is an inert gas and does not contribute to combustion.

The ratio of fuel to oxygen (air) is critical in combustion. If this ratio is too small, the fuel will be too lean to burn; if it is too great, the mixture will be too rich to burn. The limit of the fuel-oxygen ratio are known as the limits of inflammability of the fuel.

Chemical equations can be written to show how much oxygen or air is necessary for combustion. For example, when a simple hydrocarbon gas such as methane, CH_4, is burned, carbon combines with oxygen (O_2) in the air to form carbon dioxide (CO_2); hydrogen combines with oxygen (O_2) to form water (H_2O):

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Two cubic feet of O_2 are required to burn 1 cu. ft. of CH_4. Since air is 21% O_2, 10 cu. ft. of air would be required for each 1 cu. ft. of CH_4.

A burning operation such as this would be called complete and perfect combustion. The operation was complete because all of the carbon was burned to carbon dioxide (CO_2), and all of the hydrogen to water (H_2O). The operation was perfect because there was just enough oxygen present to burn all of the carbon and hydrogen with no oxygen or air left over.

An example of complete but **not** perfect combustion would be:

$$CH_4 + 3O_2 \rightarrow CO_2 + 2H_2O + O_2$$

Here we have more oxygen than is needed. In other words, the furnace is operating with excess air, or more air than it needs.

If the supply of air is insufficient or improperly mixed with the fuel, some of the carbon will burn to form carbon monoxide (CO):

$$3CH_4 + 5O_2 \rightarrow CO_2 + 2CO + 6H_2O$$

This is incomplete combustion. If more air were present, the carbon monoxide would have burned to carbon dioxide (CO_2). For example:

$$2CO + O_2 \rightarrow 2CO_2$$

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Division, Humble Oil & Refining Co.

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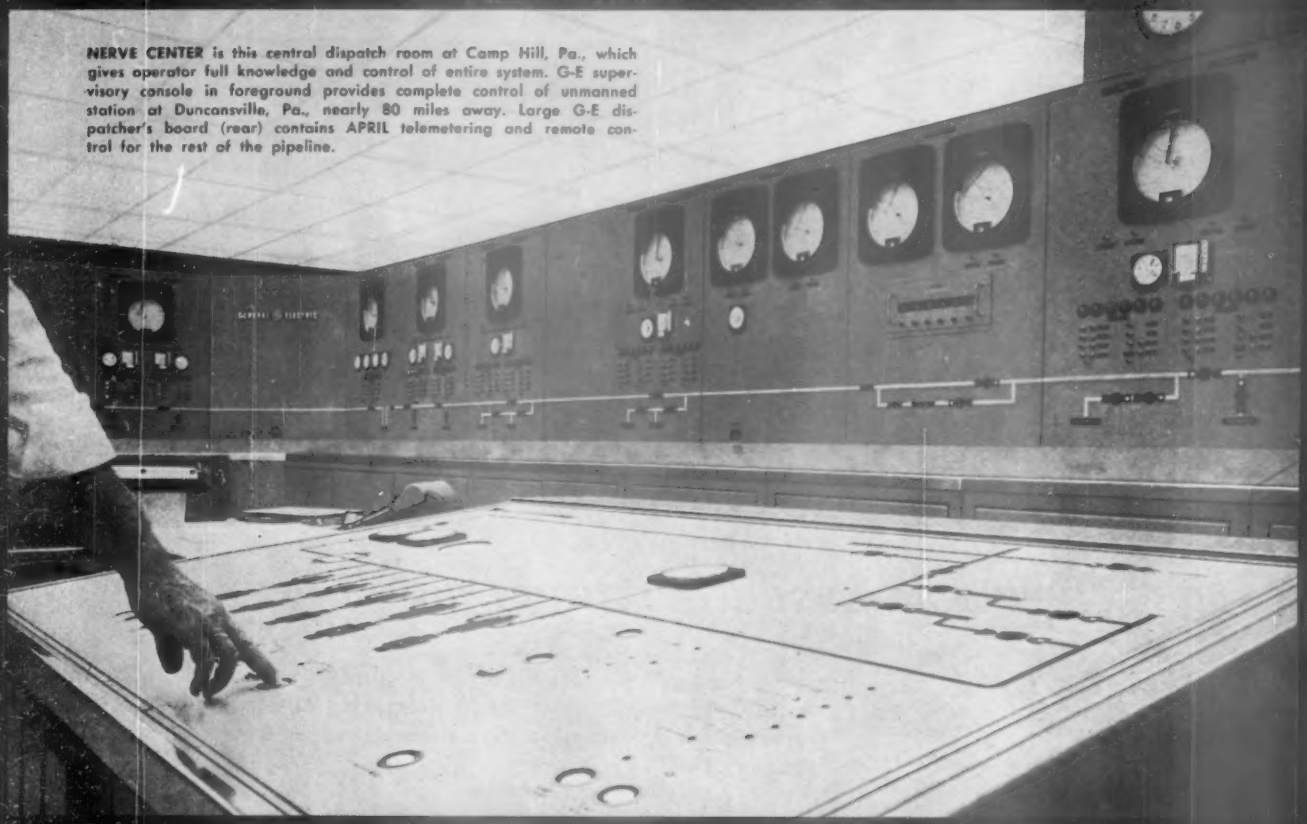

NERVE CENTER is this central dispatch room at Camp Hill, Pa., which gives operator full knowledge and control of entire system. G-E supervisory console in foreground provides complete control of unmanned station at Duncansville, Pa., nearly 80 miles away. Large G-E dispatcher's board (rear) contains APRIL telemetering and remote control for the rest of the pipeline.

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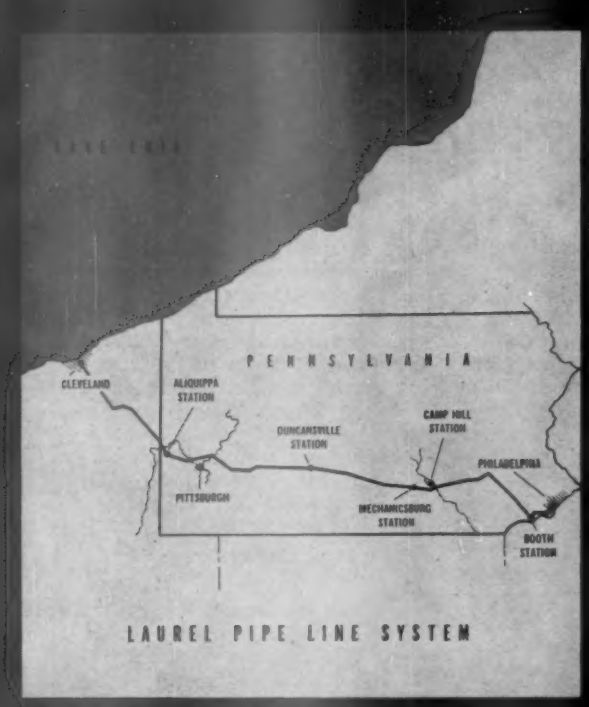

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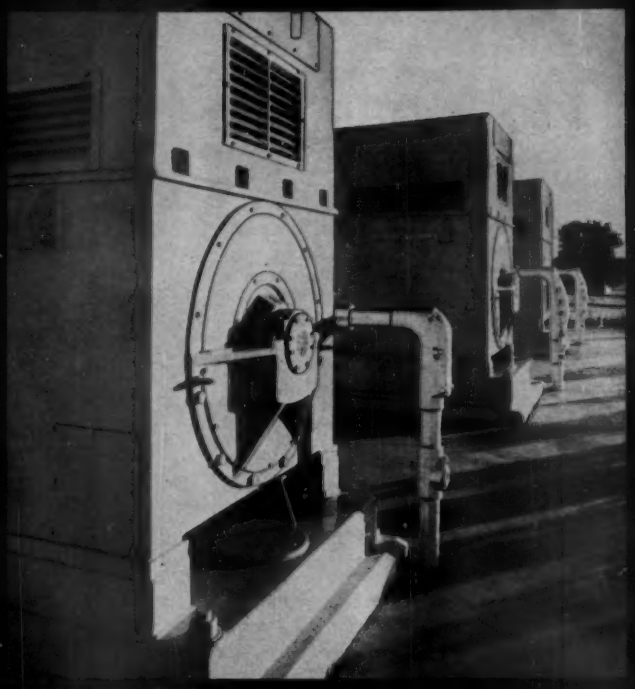

MOST POWERFUL STATION is the 3,800 hp outdoor station at Mechanicsburg, Pa. Main pumping motors are new G-E Type II weather-protected a-c motors. The four outdoor stations, all driven by General Electric motors of this advanced design, together produce 11,700 hp.

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GENERAL ELECTRIC

How gas can foul up your pump

BY JOSEPH ZABA

GAS AFFECTING the performance of a sucker-rod pump may be free gas which accompanies the oil entering the pump barrel or dissolved gas which is liberated as a result of pressure drop and agitation within the pump system.

Effect of this gas on the volumetric efficiency is twofold. First, the gas occupies space within the pump barrel, reducing the space available for oil. Second, gas interferes with the action of the pump's valves. A large number of wells produced by sucker-rod pumping are operating with low volumetric efficiency because of gas interference and in many cases improvement could be made by proper operating practices or by use of properly selected equipment.

As far as gas occupying space within the pump is concerned, even a small amount may sharply reduce the displacement of the pump. To illustrate, assume that 50 cu. ft. of gas accompanies each barrel of oil and that the submergence pressure is 50 psi. Then

$$\frac{50}{5.6} \times 14.7 = V \times 64.7$$

Where:

V = Volume of free gas under 50 psi. submergence pressure

5.6 = cu. ft. in bbl.

Under these conditions V = 2, which means that for each barrel of oil 2 bbl. of gas would have to be handled by the pump if all of the gas were to travel through the pump.

Valve action. At the beginning of the downstroke the gas in the pump barrel is under pressure of submergence. The traveling valve can not open until this gas is compressed to the pressure corresponding to the hydrostatic pressure on the top of the plunger. When the upstroke begins there is gas in the clearance space (space between the standing and traveling valve at the end of the downstroke), which is compressed to the pressure existing above the plunger. The standing valve can not open until this pressure drops to the pressure of the submergence. The later in the stroke this occurs the less opportunity the pump barrel will have to fill up with fluid.

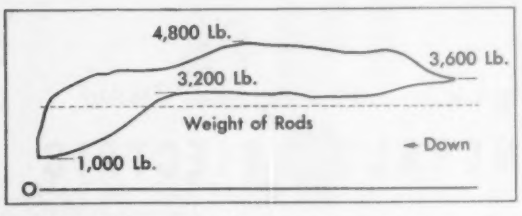
In extreme cases conditions can occur when the combination of pressures, size of clearance space, amounts of gas, and length of the plunger stroke are such that the volume of the barrel created by the upstroke of the plunger is not enough for the gas in the barrel to expand to submergence pressure. Then the standing valve is still closed at the end of the upstroke and no new fluid enters the pump. If on the downstroke the gas is not compressed to the pressure above the plunger, then the traveling valve doesn't open. The pump is gas-locked, with gas being compressed and expanded between the valves and no fluid is delivered.

Recognizing these conditions requires checking the well characteristics, the method of operating the pump, and the equipment used. Gas interference should be suspected in wells which (1) pump irregularly, (2) produce large amounts of gas through tubing, (3) pump with casing shut in, or (4) have high working-fluid level without pumping the expected production. In wells pumping with tubing on packer and not performing according to expectations gas interference would be an obvious conclusion since all the gas must pass through the pump.

Interference of gas with the operation of the pump is directly recognizable from dynamometer cards because of the indication of delayed release of load from the rods during the downstroke. The condition is illustrated in Fig. 31 which shows "pounding." It should be noted, however, that similar shape of the downstroke portion of the card may be obtained if there is incomplete filling of the barrel with fluid without gas being present.

In this case the traveling valve does not open until the plunger actually strikes the fluid on the downstroke. Release of load from the rods is usually more abrupt with fluid pound than with gas pound. However, it is sometimes difficult to determine from the dynamometer card alone whether the pound is caused by gas or by incomplete filling of the barrel.

In such a case the analysis of the card must be supplemented by checking the well's characteristics or by finding the well's working fluid level. If this fluid level is found to give the pump a satisfactory submergence pressure then the pound shown on the card is probably due to gas interference.



DYNAMOMETER CARD showing "pounding." Fig. 1.

Remedial measures. Steps taken to prevent or minimize adverse effects of gas on volumetric efficiency may be divided into two groups. To the first belong equipment and methods used to separate oil and gas so that the gas can be vented through the casing-tubing annulus and does not have to be handled by the pump. To the second group belong the equipment and methods used to minimize the effects of gas which does enter the pump barrel.

Gas anchors and bottom-hole separators belong to the first group. Their use presupposes a minimum back-pressure at the wellhead. The principle employed is that of separation by the difference in gravities. If given the opportunity, gas will escape into the annular space.

Efficiency of separation is a function of the type of gas, whether free or liberated from solution, and of the viscosity of oil. Experiments with a large-scale simulated-well apparatus, equipped with sight ports at the pump intake, showed that free gas was present in the form of large bubbles which had a tendency to rise past the pump suction.[1] The gas from solution seemed to remain in form of small bubbles which remained entrained in oil and were easily pulled into the pump suction. Higher-viscosity oil had a tendency to sweep gas bubbles into the pump.

Minimizing the effect of gas which does enter the pump barrel is accomplished by certain changes in components of conventional pumps, by use of special-design pumps, and by changes in operating practices.

Reference

1. C. A. Connally, C. R. Sandberg and N. Stein, "Volumetric Efficiency of Sucker Rod Pumps When Pumping Gas-Oil Mixtures"; Petroleum Development and Technology, AIME 1953, p. 265.

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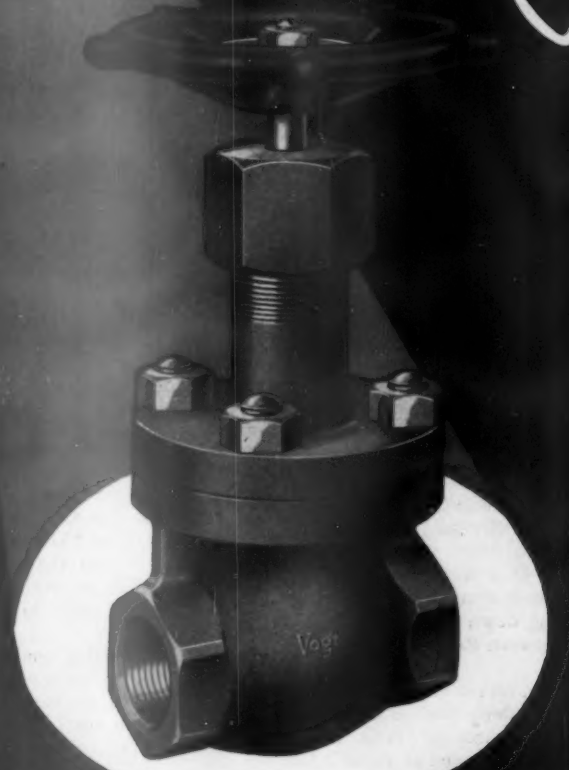

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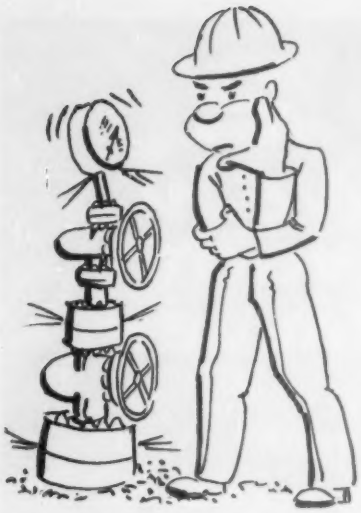


If high-pressure wells are a problem . . .

Consider concentric tubing

- Lots of experience in South Louisiana has led to the adoption of a more or less standard way to complete high-pressure gas wells.
- In wells where surface shut-in pressure will be 6,000 psi. or more, 1¼-in. tubing is being run inside the 2⅞-in. production string.
- This article explains the how and why of this operation.

BY W. D. SMITH, JR.
Chief Engineer,
Union Texas Natural Gas Corp.

HIGH PRESSURE is our biggest source of trouble!

We have drilled a lot of wells in South Louisiana, and quite a few of those were high-pressure gas wells. So we know what trouble is.

It really got started in 1944 with the completion of our No. 3 Gueno, in Branch field.

When we opened the well up for production it began to flow wash water, and in 40 minutes the surface pressure had built up to 5,100 psi. This was unexpected, so we had to kill the well and install a heavier wellhead. On final completion the well had a final shut-in tubing pressure of 6,500 psi., which was a fairly respectable pressure for those days.

Since that time we have completed many other wells in the same field in deeper reservoirs (11,000 to 15,000 ft.) with bottom-hole pressures of 8,700 to 12,200 psi., and surface pressures of 6,400 to 10,100 psi.

These wells were fairly corrosive and treatment was difficult as the wells were completed with tubing set on a production packer. One of the greatest dangers from an operating viewpoint was that of having a corrosion leak or mechanical failure close to the surface resulting in excessively high pressure on the oil string. If this happened there would be lots of trouble and danger in killing the well.

Then it happened. As expected, in the early part of 1948 we found the pressure building up on the casing on this well from what we later found to be corrosive holes in the tubing. To kill the well it was necessary to employ Otis to snub in a string of 1¼-in. drill pipe under pressure to approximately 8,100 ft. Then we were able to kill the well with weighted mud. Snubbing in the 1¼-in. drill pipe was not only expensive, but dangerous, and there were times when the outcome was in serious doubt.

After this workover our production superintendent thought that if we were able to kill this well through the small tubing string, why not install this concentric string when the well is first completed. If it were ever necessary to kill the well, it could be done either by pumping down the 1¼-in. or the annulus between the 1¼-in. and 2⅞-in.

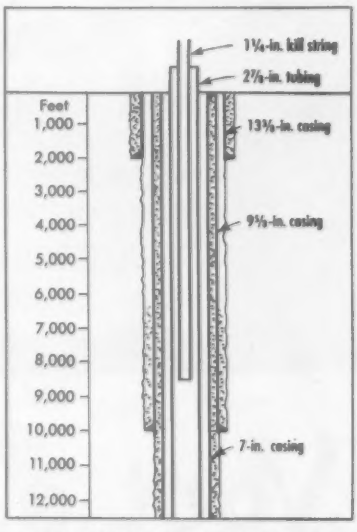
Therefore, on recompleting the well the 2⅞-in. tubing was set on a production packer and the 1¼-in. tubing was swung open ended at about 7,500 ft. As far as we know this is the first completion using this inside 1¼-in. tubing in a high-pressure gas well.

In December 1951 we had essentially this same experience with another well in Branch field. It had a shut-in pressure of 6,800 psi. and developed pressure on the casing from a split in the 2⅞-in. tubing string. Here again we had to employ Otis to snub in a 1¼-in. string to kill the well. On its recompletion we again installed 1¼-in. tubing as its use had proved satisfactory on No. 3 Gueno well.

Standard procedure. In 1952 when we began development in the southern part of Lake Arthur field, Jefferson Davis Parish, Louisiana, in a known high-pressure area we used this concentric tubing completion or kill string, as it is sometimes called, as a standard completion procedure. As a matter of policy we now use this 1¼-in. tubing string or concentric tubing completion on all wells where we expect a closed-in surface tubing pressure of 6,000 psi. or more.

To date we have completed 43 wells in five fields this way. Surface pressures range up to 13,000 psi. Normal practice is to run the 1¼-in. from 7,500 to 8,500 ft. with the longest string we have run to date being 13,600 ft.

Before completing one of these abnormally high-pressure wells, we carefully review the mechanical condition of the well on reaching total depth. On these deeper wells we usually have



TYPICAL CASING PROGRAM in a high-pressure gas well. Recent completions include the 1¼ in. "kill string" to about 8,000 ft.

Presented at fall meeting of Louisiana-Arkansas division, Mid-Continent Oil and Gas Association, New Orleans.

"To kill the well it was necessary to snub in a string of 1¼-in. drill pipe under pressure."

a 7-in. liner which has been previously set as a protective measure for drilling, that extends back into the 9⅝-in. casing. Also, in wells of this depth we have usually been drilling through the 9⅝-in. protection casing long enough to where we are afraid of developing a hole in it. As another safety measure we have set 7-in. casing on top of the liner clear to the surface inside the 9⅝-in. For completion, 4½ or 5-in. liner is then cemented through the productive sands back into the 7-in. liner. The 7-in. casing inside the 9⅝-in. is then pulled and replaced with new P-110 casing. This casing string is cemented solidly inside the 9⅝-in. casing to the surface. Before running, this casing is tested hydraulically to 80% of minimum yield (12,500 psi. for 35-lb. P-110 casing). The casing is set in tension to minimize the possibility of buckling from expansion due to the increase in well temperature on producing gas at high rates.

After conditioning the mud, the 2⅞-in. tubing string is run and set on a production packer approximately 30 ft. above the top of the perforations. Before running this tubing, it is tested to 80% of minimum yield, and the ends are checked by Magnifluxing. After making up each joint, the connection is tested to 80% of minimum yield (15,000 psi. for 7.9 lb. P-105) before running in the hole. After setting the 2⅞-in. tubing, the 1¼-in. tubing which has also been tested is Magnifluxed on the ends and run to a depth from 7,500 to 8,500 ft. This tubing is swung open-ended.

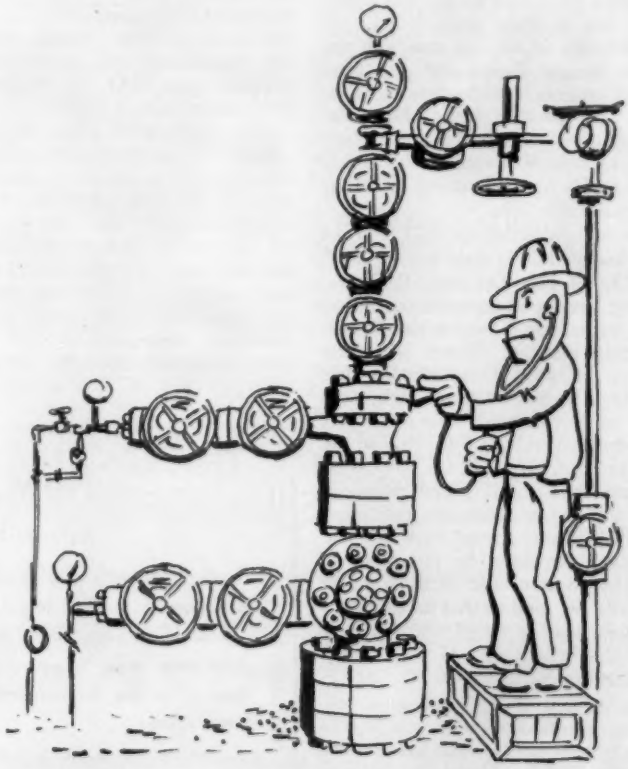
In this manner both tubing strings and wellheads are all fully connected and the well completely "buttoned up" before any attempt is made to wash it in. Before beginning to wash in, a plug is set at the bottom of the tree and the christmas tree and flow line to the heater are tested hydraulically to a pressure deemed necessary for the particular well.

The 1¼-in. tubing is run deep enough so that when the weighted mud is displaced with water, the hydrostatic head of the fluid column is low enough that the well will begin flowing. During this entire cleanout period, the well is under complete control the same as for normal producing operations. We feel that this represents maximum safety in well completion. This procedure, of course, requires time and lots of good supervision. We are convinced that in dealing with such abnormally high pressures you not only need the best of materials, but also the best of supervision, and there are very few advisable short cuts. The safest procedure in the long run is the cheapest.

Each well is equipped with a high-low shutoff valve on the christmas tree for production. Then if there is any abrupt or abnormal change in pressure the well is automatically closed in at the wellhead.

Normal procedure is to produce the well through the 1¼-in. and to inject corrosion inhibitor by means of a high-pressure chemical pump into the annulus between the 1¼ and 2⅞-in. Based on iron titrations and visual inspections, this treatment has been fairly successful to date. One advantage of flowing the well through the 1¼-in. tubing is that if corrosion does occur, it will occur on the 1¼-in. instead of the 2⅞-in. If a hole should develop, you still do not have well pressure on the casing string.

After checking and observing numerous rates of flow together with their flowing and shut-in surface pressures, we have established friction-factor curves for the 1¼-in. tubing. We have found this information help-



"In our Lake Arthur field we have made it standard procedure to thoroughly inspect the christmas tree on at least one well per year."

ful in detecting failures or holes in the 1¼-in. tubing string. As we have various lengths of 1¼-in. tubing in our wells with different flow capacities and variable rates of flow, changes in the pressure drawdown as reflected by the surface flowing pressures often do not readily reflect possible holes in the 1¼-in. tubing string.

However, from time to time we can check the surface pressures and respective rates against our drawdown curves as previously determined and see if there is a hole in the tubing. This will readily show up in the decreased friction loss for the length of tubing and the rates concerned for that well.

We have just replaced our first string of 1¼-in. tubing from corrosion after a cumulative production of some 17 billion cubic feet of gas.

In our Lake Arthur field where we have 36 of these high-pressure gas wells, we have made it a standard procedure to pull the 1¼-in. tubing for inspection and also to thoroughly inspect the christmas tree on at least one well per year. Normal practice is to select the oldest well or the one with the most gas production that has not been previously inspected.

In 7 years we have had occasion to kill 11 of these high-pressure wells to repair tubing leaks or to inspect christmas trees and tubing for corrosion. Ten of these were killed with no difficulty at all. In one well the 1¼-in. hanger flange and seal were cut out making it difficult to circulate down through the 1¼-in. However, this additional trouble was minor compared to what we would have had if we had only had one string of tubing with this same leak.

The highest pressures on a well we have had to kill to date were 10,000 and 13,000 psi. On the 10,000-psi. well we developed pressure on the oil string caused by a leak in the 2⅞-in. Camfield bushing. Water was first pumped in the 1¼-in., bleeding gas off the 2⅞-in. until we circulated water entirely around. The water was then replaced with 18.5-lb. mud in the same fashion. The 2⅞-in. was closed off and the 18.5-lb. mud squeezed down the 1¼-in. with the gas below the 1¼-in. being forced back into the formation. However, by this time we had a hydrostatic head of some 8,500 ft. of 18.5-lb. mud so that no excessive pressures were required and the well was killed in less than 12 hours after we started injecting water.

The highest surface pressure we have been confronted with was 13,000 psi. in Leleux field, Vermilion Parish, Louisiana. This is also the highest pressure that we are aware of. As we had no market for the gas it was necessary to leave the well shut in, but we did not relish the idea of leaving 13,000-psi. pressure for an indefinite period of time on a shut-in well.

After investigating several types of fluids, we decided on loading the well with 10 lb. per gal. CaCl solution to reduce surface pressure. We pumped the CaCl solution in the annulus of the 2⅞-in. tubing while producing the well on the 1¼-in. until we had circulated CaCl around the bottom of the 1¼-in. at 8,770 ft. Pump pressure slightly in excess of 13,000 psi. was needed to start pumping in. An attempt was made to force the CaCl solution to bottom, but after building up a pump pressure in excess of 13,000 psi., we were unable to squeeze it below the bottom of the 1¼-in. The CaCl solution had reduced the surface pressure to 10,200 psi., and by replacing the CaCl with heavy mud in the same manner, the pressure could have been further reduced if desired. It is fortunate that we were not faced with the problem of killing this well or trying to pump into it without the benefit of this kill string.

One of the objections we have heard to the 1¼-in. tubing is that we are unable to obtain bottom-hole pressures. With surface pressures in the range we are dealing with here we do not consider it good practice to run a bottom-hole-pressure bomb on a wire line in these wells. Tubing pressures are determined with a dead-weight pressure gage and the bottom-hole pressure calculated.

One worry we had was the rate of production we could obtain through the 1¼-in. in order to meet peak demands in view of its much lower capacity as compared with 2 or 2½-in. Of course, the rate of flow or capacity depends upon several factors such as length of tubing, reservoir pressure, productivity index of well, maximum drawdown thought advisable on surface, etc. We have produced at rates of 12.5 to 13.0 M.M. c.f. per day through the 1¼-in. alone. By producing these same wells through the annular space between the 1¼ and 2⅞-in. in addition to the 1¼-in. we have obtained flow rates of 21 M.M.c.f. per day. These maximum rates were obtained at a flowing pressure of 2,000 psi. from the closed-in tubing pressure of approximately 7,350 psi. With increasing rates of production there is an increase in surface temperature ranging from 150° to 160° F. at 4 to 6 M.M.c.f. per day to approximately 190° F. at the higher rates.

It is not possible to inject corrosion inhibitor while producing through the annular space, so if high rates are expected to continue for prolonged periods, chemical is squeezed into the formation for a batch treatment.

When producing the wells at these high rates and high temperatures, we get an increase in pressure on the casing. We watch this pressure carefully and bleed it off in order to keep it from building up higher than desired due to the expansion with increased temperatures. On reducing the rate of flow of the well we note a decreasing temperature of the flow stream with an accompanying decrease in pressure on the casing. The casing of these wells is tied into our field gas line so that when the pressure begins dropping with lower temperatures, we can build the pressure back up, and cut down on the differential pressure between the 2⅞-in. tubing and that inside the casing string.

Conclusion

We feel that the method outlined here is one of the safest for handling wells with abnormally high pressures.

The requirements for a job of this type are (1) the safest method, (2) the best in materials, and (3) the best in supervision.

The one important point to remember is that with these pressures you do not often get a second chance if a mistake is made.

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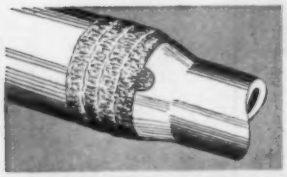

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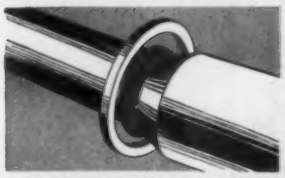

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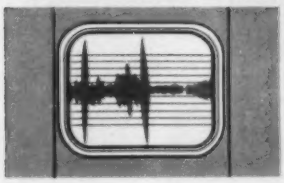

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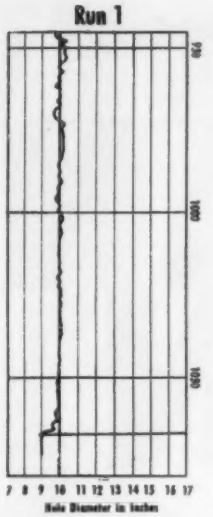


IN HARD formations in shallow portion of the hole, the caliper line follows almost on top of the gage line. No portion of second caliper survey overlapped this survey. Fig. 1.

Drillers expect little enlargement of the hole in hard formations, as shown at left, but what about soft formations? Here's proof that . . .

Drill-collar stabilizers do work in soft shales

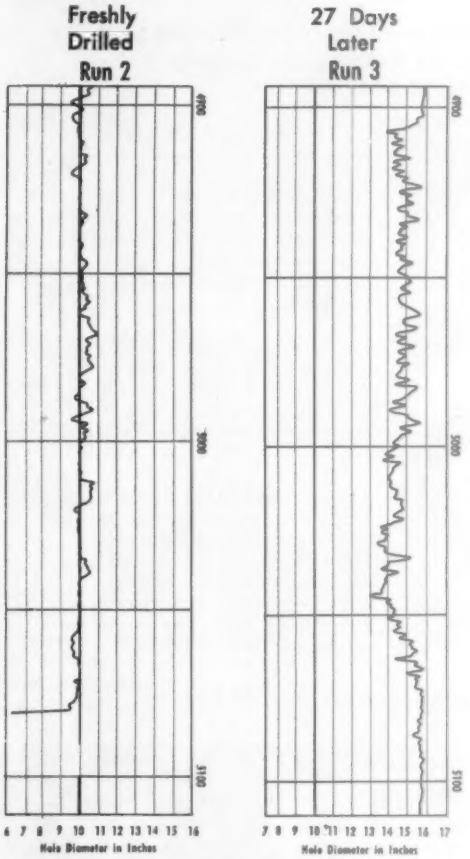
Drillers in crooked-hole areas can forget any worries they may have had about whether soft shale formations furnish a good seat for drill-collar stabilizers. A recent series of overlapping caliper surveys shows that such formations enlarge only slowly.

BY ROBERT G. PEARSON
Driltrol, Oklahoma City

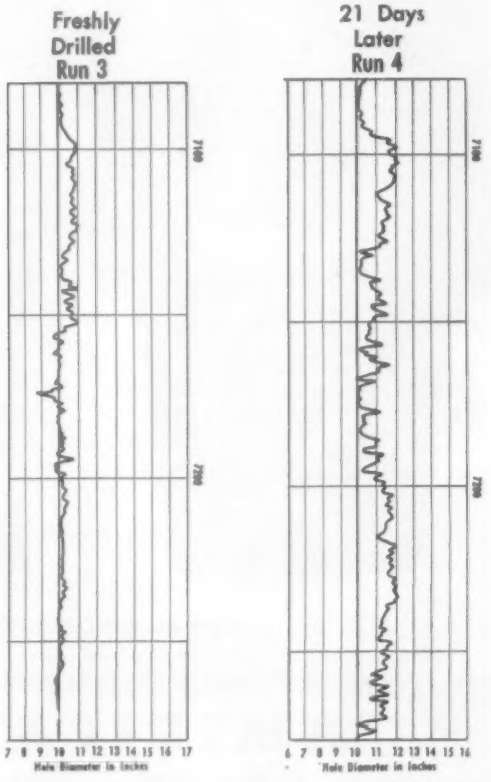
CONTRARY to what many have believed, drill-collar stabilizers can be used to good effect in softer shales. Such formations apparently do not enlarge at a fast rate and, as a result, furnish a near-gage hole on which the stabilizers can bear in helping keep hole straighter.

This conclusion results from overlapping caliper surveys made through southern Oklahoma's Springer shale. These surveys indicate that time is a very important factor in hole enlargement. True, final enlargement in

This report was made originally to the crooked-hole subcommittee of the Rotary Drilling Committee, American Association of Oilwell Drilling Contractors, during the 1960 annual meeting, New Orleans.

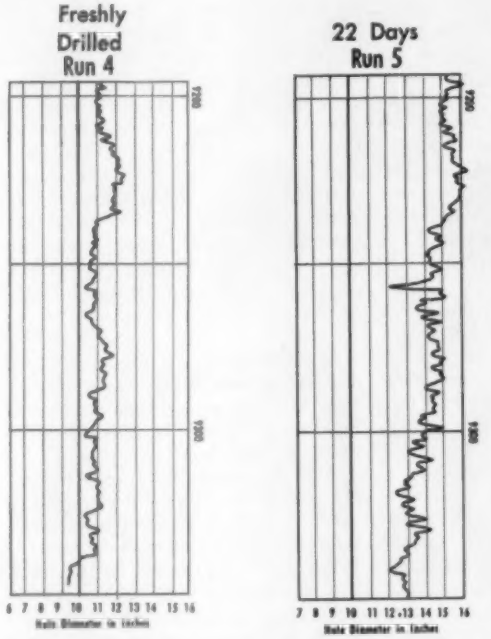


ELAPSE OF 27 DAYS caused the enlargement of the hole from 4,900 to 5,080 ft. as shown on these caliper surveys. Bottom of Run 2 is on the left; top of Run 3, on the right, overlapped when run almost 4 weeks later. Fig. 2.

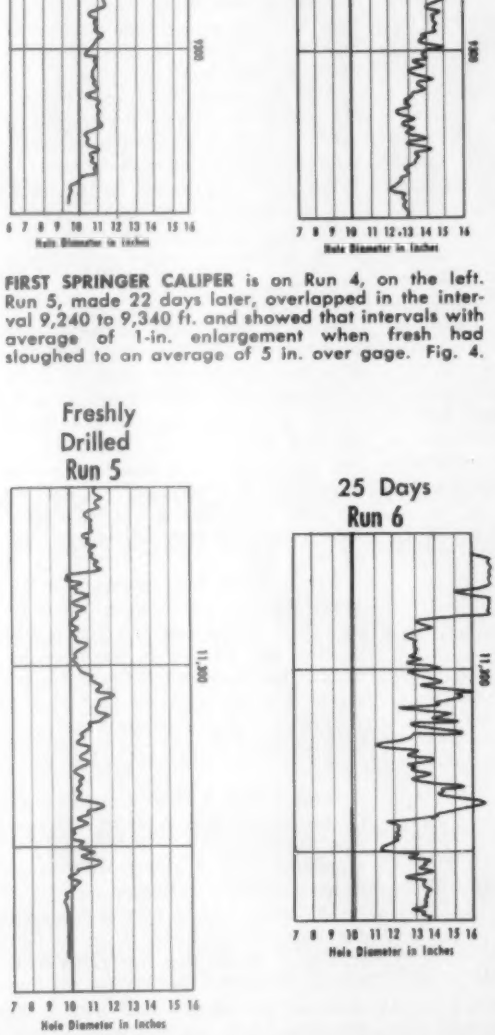


ELAPSE OF 21 DAYS caused only mild enlargement in harder formations logged at the bottom of Run 3 (on the left) and at the bottom of Run 4 (on the right). About 2 in. is maximum enlargement in this period. Fig. 3.

"We should not concern ourselves with the diameter of the hole 1,000 or 2,000 ft. off bottom. We should consider only the diameter of the hole in the first 90 ft. off bottom."



FIRST SPRINGER CALIPER is on Run 4, on the left. Run 5, made 22 days later, overlapped in the interval 9,240 to 9,340 ft. and showed that intervals with average of 1-in. enlargement when fresh had sloughed to an average of 5 in. over gage. Fig. 4.



UP TO 7-IN. ENLARGEMENT shows on portions of Run 6, taken 25 days after the same interval was logged fresh on Run 5. Neither Run 4 nor Run 5 calipered completely to the drilled depth of the hole because of fillup. Fig. 5.

softer shales may be great, but this enlargement is apparently a much slower process than many have thought. Consequently, enlargement does not have quite the detrimental effect on performance of drill-collar stabilizers previously supposed.

Only last 90 ft. important. We must bear in mind where the drill-collar stabilizers run in crooked-hole country are placed. They are almost always within the lower 90 ft. of the string. It follows, then, that if the lower 90 ft. of hole remain near gage, the stabilizers do their intended jobs. When thinking about the benefits to expect from proper use of stabilizers, we should not concern ourselves with the diameter of the hole 1,000 or 2,000 ft. off bottom. We should consider only the diameter of the hole in the first 90 ft. off bottom.

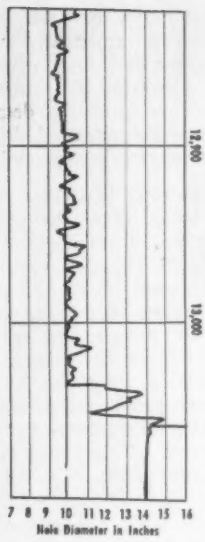
The only way to determine the true diameter of a hole is to run a caliper survey. In most cases in the Mid-Continent area where a caliper log is run at all, the run is usually made only after the softer formations have been drilled for days, weeks, or even months. This type of survey tells us nothing as to the diameter of those softer formations when they were fresh and composed the lower 90 ft. of hole. Yet, from this type of survey, many people have formed the opinion that formations like the Springer shale enlarge far too rapidly for drill-collar stabilizers to be of benefit.

Some thought the Springer enlarged by several inches almost immediately as it is drilled. There is now evidence that the enlargement is a much slower process. First of all, contractors frequently find there is drag on the drill string for the first 100 ft. or so in coming off bottom for a round trip. There should be no such drag if the hole were greatly enlarged.

It is extremely rare for a caliper survey to be made while drilling in the softer Springer formation, but we now have the runs made recently during the drilling of a deep wildcat in southern Oklahoma. The well was Shell Oil Co.'s 1B Halkins in 15-8s-5e, Marshall County. Approximately 6 months were required to drill the well.

Thick Springer section. During the 6-month period, eight microcaliper surveys were run. Shell averaged one survey every 3 weeks. Longest time interval between runs was 46 days; shortest was 8 days. Of course, not all the runs were made in the Springer formations, since top of the zone is 8,870 ft. Drilling stopped at 14,210 ft., still in the Springer.

All caliper surveys except numbers



FINAL 10 ft. of Run 6 registered enlargement of 4-in., the only place in any of eight runs where there was much enlargement of fresh hole. No part of Run 7 overlapped Run 6, so no comparison is possible. Fig. 6.

2 and 7 relog an interval of hole also logged on the next previous run. This relogging is quite significant; it affords us the opportunity to measure the diameter of an interval of hole while it is at the bottom of a run and reasonably fresh. Then at the top of the next run we have an opportunity to measure the same interval a few days later. Then we can compare the lower portion of one run with the upper portion of the following run. This comparison shows clearly how the formations tend to enlarge with time.

Surveys 1 and 2. The first survey logged the hole from 50 ft. to 1,067 ft. The lower 100 ft. of this run, obviously is a harder formation, is shown in Fig. 1. Run 2 did not overlap with any part of run 1, so the upper portion of run 2 is not reproduced adjacent to the lower 100 ft. of run 1. In the reproduced portion of run 1 the caliper line follows the gage line so closely that it is difficult to distinguish one from the other.

Surveys 2 and 3. In Fig. 2, the lower 180 ft. of run 2 (4,900 to 5,080 ft.) is shown adjacent to the same interval as it appeared at the top of run 3 just 27 days later. Comparing the two logs, we see that while the hole was practically gage when fresh, it enlarged as much as 5½ in. by the time it was 27 days old.

Surveys 3 and 4. Fig. 3 shows the final 112 ft. (7,148 to 7,260 ft.) logged at the bottom of run 3, and the same interval as it appeared 21 days later at the top of run 4. This particular interval of hole, again in a harder formation, was gage when fresh and held its gage comparatively well. An enlargement of 2 in. was maximum for the entire interval after it had been drilled in for 3 weeks.

Into the Springer shale. Run 4 logged the hole from 7,100 ft. to 9,340 ft. As we've already mentioned, the top of the Springer was called at 8,870 ft. Thus, we get our first look at the Springer shale in the lower portion of run 4.

At the time run 4 was made, total depth of the well was 9,381 ft. However, because of fillup, the logging crew was unable to survey the hole below 9,340 ft.; this leaves us with 41 ft. of unsurveyed hole. With this in mind, we see that Fig. 4 shows only the final 100 ft. of hole (9,240 to 9,340 ft.) that was logged, rather than the final 100 ft. of hole that had been drilled.

This same interval is shown in Fig. 4 as it appeared 22 days later near the top of run 5. When fresh, this interval had an average enlargement of 1 in.; 22 days later it was enlarged as much as 5 in.

Runs 5 and 6. At the time run 5 was made, total depth was 11,422 ft. Due to fillup, it was not possible to log below 11,368 ft., leaving 54 ft. of unsurveyed hole.

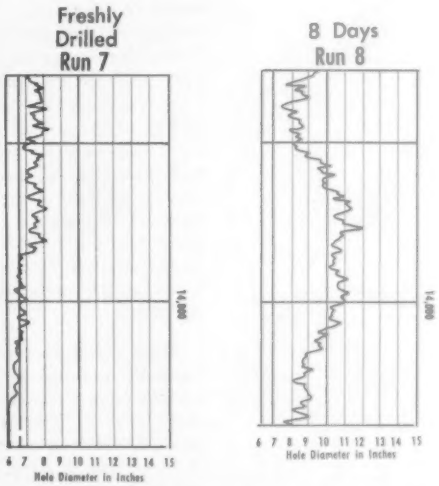
Fig. 5 shows the final 100 ft. (11,269 ft. to 11,368 ft.) logged on run 5 together with the same interval as it appeared 25 days later on run 6. When fresh, this interval had an average enlargement of ¾ in. Twenty-five days later it was enlarged as much as 7 in.; average enlargement was 4 in.

Runs 6 and 7. Run 6 logged the hole from 11,268 ft. to 12,979 ft. The hole was enlarged as much as 7 in. at the top and tapered down to practically gage hole near the bottom of the run. However, the final 10 ft. of the run indicates a hole 14 in. in diameter, or 4 in. enlarged. During all eight runs, this is the only place where there is such an enlargement of fresh hole.

Fig. 6 shows hole diameter of the lower 100 ft. of run 6, from 12,879 ft. to 12,979 ft. Because run 7 does not overlap any of run 6, we have no chance for a second look at the interval. Consequently, no part of run 7 appears adjacent to the lower portion of run 6.

Runs 7 and 8. The previous runs (1 through 6) were made in hole that was drilled with a 9⅞-in. bit. The remaining runs (7 and 8) were made in hole drilled with 6½-in. bits.

The lower 100 ft. of run 7 logged the hole from 13,932 ft. to 14,032 ft. Fig. 7 shows this run along with the same interval as it appeared just 8 days later on run 8. When fresh, the lower half of this interval was gage hole. The upper half was enlarged approximately 1 in. Only 8 days later this same interval was more than 4 in. enlarged in places.


Freshly Drilled Run 7
8 Days Run 8
14,000
14,000
6 7 8 9 10 11 12 13 14 15
Hole Diameter in Inches
6 7 8 9 10 11 12 13 14 15
Hole Diameter in Inches

IN REDUCED HOLE, Runs 7 and 8 are still calipering Springer shale. Where previous runs were in 9⅞-in. hole, these are in 6½-in. After only 8 days, there was 4-in. enlargement in some intervals. Fig. 7.

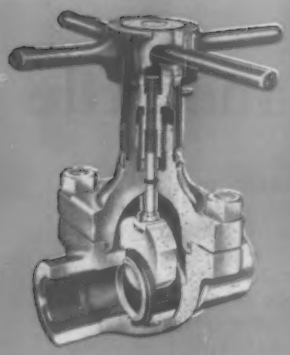


Figure 2126 Resilient Seat Gate Valve. 2", 3", 4", 2000 lb W.P. EValcoat protective Plastic Coating.

Figure 2699 Forged Steel Angle Valve. ½", ¾", 1", 2000 lb WOG. Not Plastic Coated.

Figure 152J Forged Steel Gage Valve. Size ½", 4000 lb WOG. Not Plastic Coated.

Figure 2696 Throttle Disk Forged Steel Globe Valve. Size 1", 2000 lb WOG. EValcoat Plastic Coating.

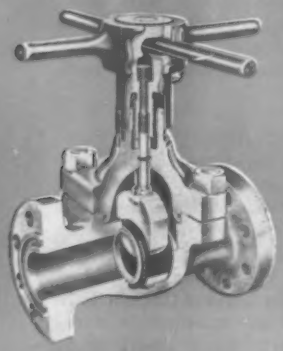


Figure 3116 Resilient Seat Gate Valve. 2", 3", 4", 2160 lb W.P. EValcoat protective Plastic Coating.

Figure 126 Forged Steel Strainer. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

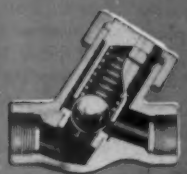


Figure 2676 Forged Steel Check Valve. Size 1", 2000 lb WOG. EValcoat protective Plastic Coating.

Figure 448 Forged Steel Globe Valve. 1½", 2", 2000 lb WOG. Not Plastic Coated.

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Marketing research can help the little

BY JAMES D. HUGHES
James D. Hughes & Associates
Houston

MARKET RESEARCH may be an answer to the profit pinch being experienced by the small manufacturer-marketer of oil-field tools and equipment. The larger firms have been able to improve their position significantly through consolidation and centralization, but this situation does not exist for the smaller firm.

Most businesses have squeezed out all the profit-margin improvements possible by the elimination or reduction of the obvious excessive costs, wastes, and inefficiencies. That which remains is more difficult to attack because it is not so easily seen.

In the case of the manufacturer-marketer, there are essentially two broad areas of activity: procurement and production, and sales and promotion. In the former, one is usually working in the confines of a plant with materials, machines, and processes; with long-established detailed cost accounting, and with soundly derived standards of performance against which to gage production efficiency.

Almost everything in this area is visible and open to inspection, measurement, and direct control. In the latter area, by contrast, one is working in widely scattered localities with ideas; words and numbers both oral and printed; and principally with people.

In such an environment, it is reasonable to expect many negative and unhealthy profit situations to exist; unrecognized problems, which, if exposed to view by some practical device, could be attacked with conventional solution techniques. Also, it is possible for many unrecognized opportunities to exist, which if uncovered could be exploited for additional gain.

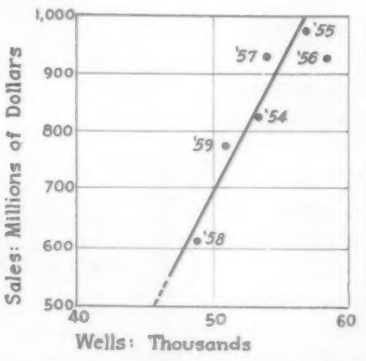
Marketing research has been used by practically all of the larger successful manufacturer-marketers in reaching a position of market dominance and satisfactory profits. Broadly defined, it is the systematic, objective, and thorough exploration for; and the distillation, study, and analysis of; all pertinent information bearing upon any marketing problem. It includes the analysis of the firm's products and services, as well as the analysis of the firm's selling methods and practices.

Long and short-term forecasting of markets, the establishment of sales expectancies, the estimation of probable market and demand for proposed new products, the periodic measurement of market penetration, are but a few of the activities included in marketing research concepts of this kind.

Small firms lacking. The fact that there are a relatively large number of small manufacturer-marketer firms which do not take advantage of marketing research may be due to their association of the word "research" with costly laboratories, expensive scientists, incomprehensible statistical manipulations, or an experimental environment far beyond their resources.

It should be reassuring to such a group to learn that, to a considerable extent, whenever they can reduce their problems to a series of clearly stated questions, the solutions can be found from the study and analysis of internal records at little cost. They will find, too, that much published information helpful to their studies is available from many sources for little more than the asking. Only when externally developed data are necessary, and it is either inappropriate or inexpedient to use their own people, need they seek the aid of an outside specialist.

There is nothing better than a question to stimulate the thinking process. It triggers the imagination and, in its efforts to answer the primary question, the mind suggests a lengthening chain of secondary questions and pursues the consequences of each possible answer. What more effective means then, of communicating the essence of marketing research, than to present a number of typical bite-size questions to the reader and let the answers he gives constitute a sort of self-administered audit of his needs and possible benefits from this study.



OIL-FIELD MACHINERY, equipment, and service sales correlate well with wells drilled. The curve is not linear because deep drilling is hurt most in slack seasons.

Such an audit will either reveal to him that he has been doing marketing research by another name, or in the process of considering the consequences brought to conscious recognition by the questing mind, it will reveal to him that perhaps he should be doing market research by any name. Within the modern marketing concept, the questions on the opposite page relate to activities, conditions, or states of knowledge that can affect profits either directly or indirectly.

To participate in this little exercise, the interested reader has only to check the reply box which he considers the most truthful answer to each question.

Good sample. Although these questions by no means cover the full scope of marketing research, they do constitute a fairly diagnostic sample. The reply boxes for each question have been positioned so that if the box checked falls in Column I it is indicative that the checker has not only thought about the question as it relates to ultimate profit contribution, but in addition has either found the answer and taken action, or is fortified with knowledge of what action should be taken when feasible.

Should the majority of the check marks fall in Column I the checker has been practicing marketing research whether he calls it that or not. Furthermore, by virtue of this condition, he is in a better position to profit from his marketing operations than a competitor, for example, whose checks might fall in Columns II or III.

If, however, the bulk of the reader's checks fall in Columns II and III, it is indicative that he has given little or no thought to the profit or loss implications associated with the questions; or if he has, he considers them of no consequence or insufficiently so to have justified more complete investigation or follow-through.

Such a position, it should be apparent, would in all likelihood place him under a disadvantage in a competitive market with other manufacturer-marketers who are applying marketing research techniques to squeeze out improved margins and to better insure the success of their firms in the future.

The oil business has not gone to hell—it is only going through it. The lessons on survival now being learned will improve the state of our commercial existence in the years ahead no matter what their character.

fellow, too. Test your need for it here

Check list on your marketing-research efforts

1. Do we know whether the long-range market for our product is expanding, contracting, or static?	Yes ☐	No ☐	Not clearly ☐
2. Do we know whether our share of the total market last year increased or decreased?	Yes ☐	No ☐	Not reliably ☐
3. Do we know how the remainder of the market is being shared by our principal competitors?	Yes ☐	No ☐	Vaguely ☐
4. Is our sales force properly organized, adequately trained, and efficiently located in relation to available business?	Yes ☐	No ☐	Not studied recently ☐
5. Do we have any territory or market segment where sales in volume is unaccountably low in relation to available business?	No ☐	Yes ☐	Only suspect ☐
6. Do we have any territory or market segment where the volume and share of business is acceptable but the profits are unsatisfactory?	No ☐	Yes ☐	Unable to pinpoint ☐
7. Have we carefully analyzed the salesman's job and provided him with a job description so that there is no misunderstanding as to what is required of him?	Yes ☐	No ☐	Not in detail ☐
8. Have we determined what personal qualifications in salesmen would be most effective with the buyers in our market from the standpoint of age, education, experience, training, etc.?	Yes ☐	No ☐	Have own ideas ☐
9. Are we employing a satisfactory system for regularly appraising our salesmen and aiding them in their growth and development?	Yes ☐	No ☐	Partially ☐
10. Do we know the whole cost of the average sales call company wide and by territory?	Yes ☐	No ☐	Est. only ☐
11. Do we know how much of the average salesman's working day is spent in the presence of potential users in position to buy our product?	Yes ☐	No ☐	No recent check ☐
12. Do we have enough salesmen in each market area to call upon each important buyer at optimum frequency?	Yes ☐	No ☐	Not sure ☐
13. Are there any nonselling tasks we require our salesmen to perform that could be performed in some other manner to give our salesmen more time to sell?	No ☐	Yes ☐	Never studied ☐
14. Can we improve sales performance by making more effective use of selling time available to our salesmen?	No ☐	Yes ☐	Never assayed ☐
15. Do we provide our salesmen with up-to-date sales aids and train them in their effective use?	Yes ☐	No ☐	Needs not clear ☐
16. Do we provide our salesmen with adequate incentives to exceed quotas and control expenses?	Yes ☐	No ☐	Not sure ☐
17. Can the flow and feedback of essential communications between salesmen and home offices be improved?	No ☐	Yes ☐	Never studied ☐
18. Do we know the real reasons why our business with certain key accounts has been slipping?	Yes ☐	No ☐	Not sure ☐
19. Has the appeal of our product been lessened by shifting of industry attitudes and changes in buying patterns?	No ☐	Yes ☐	Don't know ☐
20. Have we made a comparative value analysis of our product and those of our principal competitors?	Yes ☐	No ☐	Not in detail ☐
21. Is the quality of our product higher than it practically need be in today's market?	No ☐	Yes ☐	Never analyzed ☐
22. Have we reengineered our product to be as simple as possible for us to make and for the user to install, operate, and maintain?	Yes ☐	No ☐	Haven't considered necessary ☐
23. Have we eliminated unprofitable items from our product line and concentrated sales efforts on the more profitable?	Yes ☐	No ☐	Never analyzed completely ☐
24. Have we eliminated unprofitable customers and prospects from our contact list?	Yes ☐	No ☐	Never considered ☐
25. Are the users adequately informed or trained to derive maximum performance and service life from our product?	Yes ☐	No ☐	Never considered ☐
26. Is the picture of our company in the mind of the potential user of our product one that would deter him from doing business with us?	No ☐	Yes ☐	Never inquired ☐
27. Do we know how our company rates in the esteem of the buyers for our product in comparison with our principal competitors?	Yes ☐	No ☐	Not clearly ☐
28. Are all elements of our total marketing effort consistent with the picture of our company we are trying to establish?	Yes ☐	No ☐	Haven't studied ☐
29. Are we making plans to diversify our product line into new markets in anticipation of present market saturation or its possible disappearance through technological advancements?	Yes ☐	No ☐	Conversation only ☐
30. During any lengthy development of a new product do we check the anticipated market to determine if any significant changes have occurred?	Yes ☐	No ☐	Only superficially ☐
31. Do we obtain an independent check on the market potential of a proposed new product before spending heavily in its development?	Yes ☐	No ☐	Never considered ☐
32. Are there too many middlemen in our channel of distribution in relation to our present and probable future margins?	No ☐	Yes ☐	Never studied ☐

(See text on opposite page for instructions in using this check list.)

W. L. NELSON, Technical Editor and Petroleum Consultant

In octane upgrading, what's the value of low-octane gasoline

What is the practice with regard to the value to the refinery of low-octane gasolines? We are considering two processes by which we can increase the octane number of our plant gasoline and one of them involves upgrading of our present gasolines. S. G. T.

The value of intermediate or unfinished stocks is always a problem especially because the situation of each refinery is different and therefore each refinery has a somewhat different answer as to the value of its intermediate stocks. However, the value of gasoline or naphthas can be estimated with fair accuracy because prices are posted as a function of octane number.

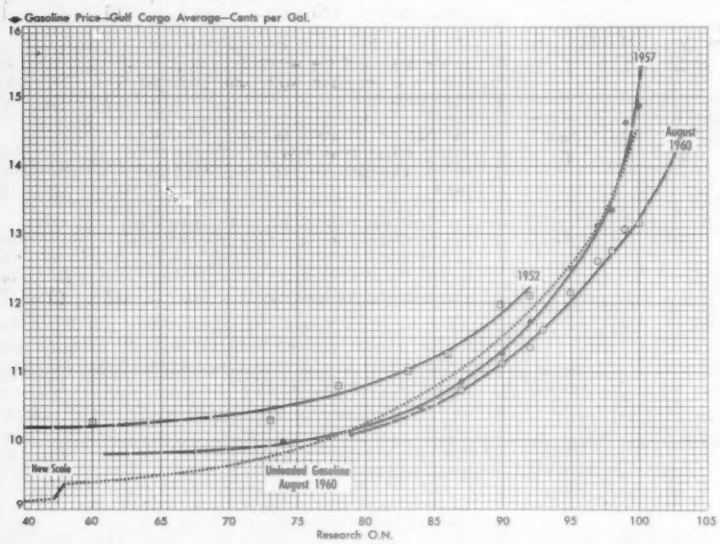
Although the prices of Fig. 1 (average of Gulf Coast cargoes) probably do not apply to any one refinery, the differences in the price of gasolines of different octane number should apply fairly well to almost all refiners. The three main lines of Fig. 1 show average gulf cargo prices during 1952, 1957, and on August 15, 1960. The dashed line is also based on August 1960 but it shows the values of the unleaded naphthas or gasolines that could be processed by the refiner in upgrading the octane number of his plant gasoline. Note that it is more profitable to use tetraethyl lead for naphthas having clear octane numbers higher than about 79, whereas if the naphtha has an octane number lower than 79 it can be most profitably upgraded by the use of various refinery processes. This situation, of course, applies only to the price situation of 1960 and to the types of processing equipment generally available in refineries during 1960.

According to Fig. 1, the values of naphthas or gasolines relative to a low-octane (under 50) naphtha in terms of the clear octane numbers of the naphthas are shown in the table.

Somewhat similar price data but for the years between 1938 and 1955 were published in the Questions on Technology page of April 25, 1955 (p. 135) in The Oil and Gas Journal.

Relative Values of Naphthas

Clear research Oct. No. of naphtha under 50	Relative value, ct. per gal. Aug. 1960 zero (basis)	Increase in value per unit Oct. No.
60	0.28 more	
65	0.39	0.024
70	0.52	0.035
75	0.74	0.061
80	1.13	0.086
82	1.33	0.107
84	1.56	0.115
86	1.79	0.127
88	2.07	0.152
90	2.40	0.175
92	2.77	0.200
94	3.20	0.215
95	3.43	0.225
96	3.65	0.260
97	3.95	0.385
98	4.42	0.535
99	5.02	0.58



POSTED PRICES of gasolines (average Gulf cargoes) as a function of research octane number. Fig. 1.

How tanker size affects transportation costs

How much cheaper is ocean transportation in the large new supertankers? R. B. T.

Two references have stated the effect of tanker size on cost of transportation (Kahle and Kelly, "The Role of Sea Transportation in the Petroleum Industry," and Frankel and Newton, "Current Economic Trends in the Location and Size of Refineries in Europe," both presented at the 1959 Fifth World Petroleum Congress, New York), and the average of these estimates is:

16,600 dw. ton (T-2)	100
20,000 dw. ton	90
30,000 dw. ton	69
40,000 dw. ton	60
60,000 dw. ton	50.5
80,000 dw. ton	46
100,000 dw. ton	43.5

If the average breakeven cost is USMC-35, then the USMC rates that permit breakeven operation is somewhat as follows:

16,600 dw. ton (T-2)	USMC -20
20,000 dw. ton	USMC -32.5
Average tanker	USMC -35
30,000 dw. ton	USMC -48
Tankers under construction	USMC -53
40,000 dw. ton	USMC -55
80,000 dw. ton	USMC -65.5

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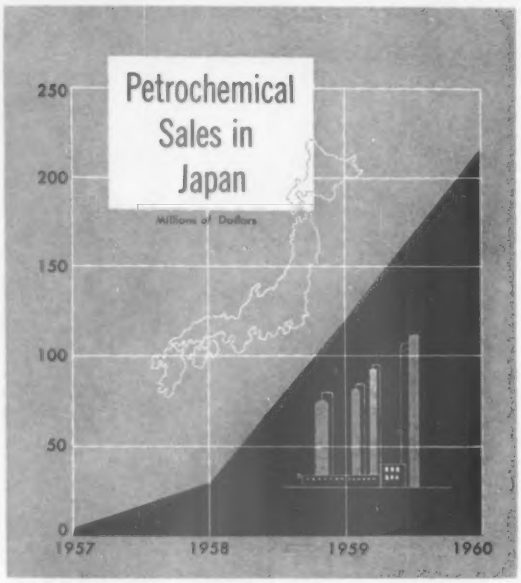
Petroleum-chemical sales in Japan up 5,000% in 4 years

Unlike the general picture elsewhere in the world, the "petrochemical" industry in Japan is really divided into two distinct parts—chemicals from natural gas, and chemicals from petroleum. The latter got a late start in Japan, but has shown unusual vigor.



PETROLEUM-CHEMICAL SALES have skyrocketed from $4.2 million in 1957 to an estimated $220 million for 1960. These figures do not include sales of chemicals produced by the natural gas-chemical industry.

BY HUGH S. PYLANT
Petrochemical Editor

THE JAPANESE petrochemical industry is divided into two distinct divisions: the natural gas-chemical industry and the petroleum-chemicals industry. The companies involved in producing chemicals from natural gas are not, generally, associated in any way with companies that make chemicals from petroleum. This is partly because the natural gas in Japan, for the most part, is dry gas which is not connected with the production of petroleum. Also, the natural gas-chemical industry got its start in 1952 and was well advanced before the petroleum-chemical industry came into existence in 1957.

Natural Gas Chemicals

Methanol was the first chemical made from natural gas. Japan Gas-Chemical Co., Inc., built a 3,600-metric-ton per year plant in Niigata in 1952, and production costs proved so low compared to the conventional coke method that it was soon expanded to 60,000 tons per year. This plant was followed by other methanol facilities by Akita Petrochemical Industry Co., Ltd., in 1956, and Toyo High-Pressure Industries, Ltd.

As a result of these projects and expansions, methanol from coke is being gradually replaced by the natural-gas product. Only 38,000 metric tons of coke-methanol were produced from April 1958 to March 1959 out of the total methanol production of 121,000 metric tons. Japan's 1959 consumption was estimated at 143,000 metric tons, with more than 60% of this going to formaldehyde to make urea-formaldehyde resins.

Ammonia. Japan Gas-Chemical Co., Inc., was also the first to produce ammonia from natural gas. The unit went on stream at the Niigata plant in March 1957 with a capacity of 33,000 metric tons annually, and was doubled in size 2 years later. In 1958, three more ammonia-synthesis units went on stream using natural gas for a raw material. Toyo Gas-Chemical Industries, Ltd., brought a 33,000-ton

MITSUI PETROCHEMICAL CO. occupies the near half of this installation on the Inland Sea, and Koa Oil Co.'s refinery the other half.

TABLE 1—PRESENT STATUS OF THE NATURAL GAS-CHEMICAL INDUSTRY IN JAPAN

Company	Products	Annual Capacity (Metric tons)	Start-up Date	Consumption of Natural Gas (m^3/day)	Remarks
Japan Gas-Chemical Co., Inc.	Methanol	60,000	Sept. 1952		Japan Gas Chemical process
	Ammonia	66,000	March 1957		Chemico process
	Urea	56,000	March 1957		Chemico-Sumitomo process
	Ammonium sulfate	110,000	March 1957		Japan Gas Chemical process
	Hydrogen cyanide	3,600	July 1960		Japan Gas Chemical process
	Acetylene				
	Total			570,000	
Akita Petrochemical Co., Ltd.	Methanol	31,000	July 1958		Gas Reforming: Grande Paroisse process
		18,000	June 1960		Methanol synthesis: Sumitomo process
	Total			150,000	
Toyo Gas Chemical Industries, Ltd.	Ammonia	36,700	May 1957		Grande Paroisse process for gas reforming and NH_3 synthesis.
	Urea	57,300	May 1957		
	Ammonium sulfate	72,400	May 1957		
	Total			120,000	
Tohoku Fertilizer Co., Ltd.	Ammonia	35,000	July 1958		Dates shown are when coke process was replaced by natural gas.
	Ammonium sulfate	191,200	July 1958		
	Potassium-Ammonium Phosphate	94,000	July 1958		
	Total			100,000	
Toyo High-Pressure Industries, Ltd.	Methanol	19,200	Feb. 1958		Gas reforming and NH_3 syntheses: Grand Paroisse process.
	Ammonia	36,700	July 1958		
	Urea	66,000	July 1958		
	Ammonium sulfate	10,300	July 1958		Methanol syntheses: Montecatini process
	Methanol	15,600	Feb. 1960		
	Ammonia	37,700	Sept. 1960		Toyo High-Pressure process
	Urea	61,000	Sept. 1960		
	Ammonium sulfate	2,100	Sept. 1960		
	Total			294,000	
Asahi Glass Co., Ltd.	Ammonia	33,000	Oct. 1959		Chemico process
	Ammonium chloride	99,000	Oct. 1959		Asahi Glass process
	Sodium-carbonate	99,000	Oct. 1959		Asahi Glass process
	Total			186,000	
Kyowa Gas Chemical Industries, Ltd.	Hydrogen cyanide	380	Nov. 1959		Offgas from acetylene will go into production of 100 metric tons of methanol daily.
	Acetylene				
	Total			10,000	
Shin-etsu Chemical Industries, Ltd.	Chloromethane		Apr. 1959		
Tekkosha Co., Ltd.	Chloromethane	300			

TABLE 2—JAPAN'S MAJOR PETROCHEMICAL PRODUCTS

(Estimated production in metric tons for 1960)

Product	Output
Acetaldehyde	35,000
Acetylene	52,000
Acrylonitrile	24,000
Aromatics	70,000
Carbon black	44,000
Ethylene	125,000
Ethylene glycol	16,000
Ethylene oxide	9,000
Polyethylene	70,000
Polypropylene	55,000
Polystyrene	15,000
Styrene monomer	25,000
Synthetic rubber (SBR)	239,000

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plant on stream in May in the Niigata area; a 36,700-ton plant to produce ammonium sulfate and urea was started up in July by Toyo High-Pressure Industries, Ltd., in the Chiba area; and also in July, Tohoku Fertilizer Co., Ltd., located in the Akita area switched from coke to natural-gas raw material.

Ammonia capacity in Japan as of April 1959 was 1,420,000 metric tons. The estimated consumption from August 1959 to July 1960 was 910,000 metric tons, leaving 510,000 tons to be exported into a world market that already has a surplus of fertilizer.

Others. Kyowa Gas-Chemicals, Ltd., began producing 32 tons per month of hydrogen cyanide at Nakajyo in February 1960. The feed stock consists of natural gas, ammonia, and air. Also in May 1960 Japan Gas-Chemical began making 12 tons per day of hydrogen cyanide from natural gas.

Chlorinated hydrocarbons are being produced from natural gas by Shinetsu Chemical Industries, Ltd., in Naoetsu, and Tekkosha Co., Ltd., in Shizouka.

So far there are no facilities for producing acetylene from natural gas in Japan, but several companies such as Japan Gas-Chemical and Kyowa Gas-Chemicals are studying the situation and construction may be under way by 1961.

More details of Japan's natural gas-chemical industry are set out in Table 1.

Petroleum Chemicals

The first plant in Japan to be classified as "petrochemical" was at Shimotsu refinery of Maruzen Oil Co., Ltd. It began production of secondary butanol and methyl ketone in April 1957. This was the first step in a 5-year petrochemical-development program which resulted in an investment of $228 million by 13 companies in 14 plants. Plans already under way indicate that plant investment in a second 5-year program may well exceed $300 million (OGJ, Sept. 5, p. 140 and Nov. 7, p. 139).

Petrochemical sales have climbed from $4.2 million in 1957 to an estimated $220 million for 1960, as shown in the graph. Due to this rapid growth of the petrochemical industry, Japan is beginning to change from an importer to an exporter of organic chemicals. For example, around 11 million metric tons of plastics were exported in 1958; last year this figure climbed to 18 million, and should be much higher this year. Table 2 gives some estimated production figures expected to be reached by Japan's petrochemical industry in 1960. Here's a brief rundown on some of the more important products:

Polyethylene. At present, there is excess capacity in the medium and low-pressure plants, but more demand is developing for these materials and the picture is expected to improve shortly. The plants producing high-pressure polyethylene are running at top capacity and still cannot meet the demand for this product. At least five companies have plans under way to increase output of the high-pressure material to meet the estimated demand of 83,000 metric tons in 1962.

Polypropylene. This new plastic that can be spun into synthetic fibers is destined to play a big part in Japan's economy. There are presently no producing plants in Japan, but seven companies have plans or construction well under way. Demand for this product is expected to exceed 70,000 metric tons in the near future.

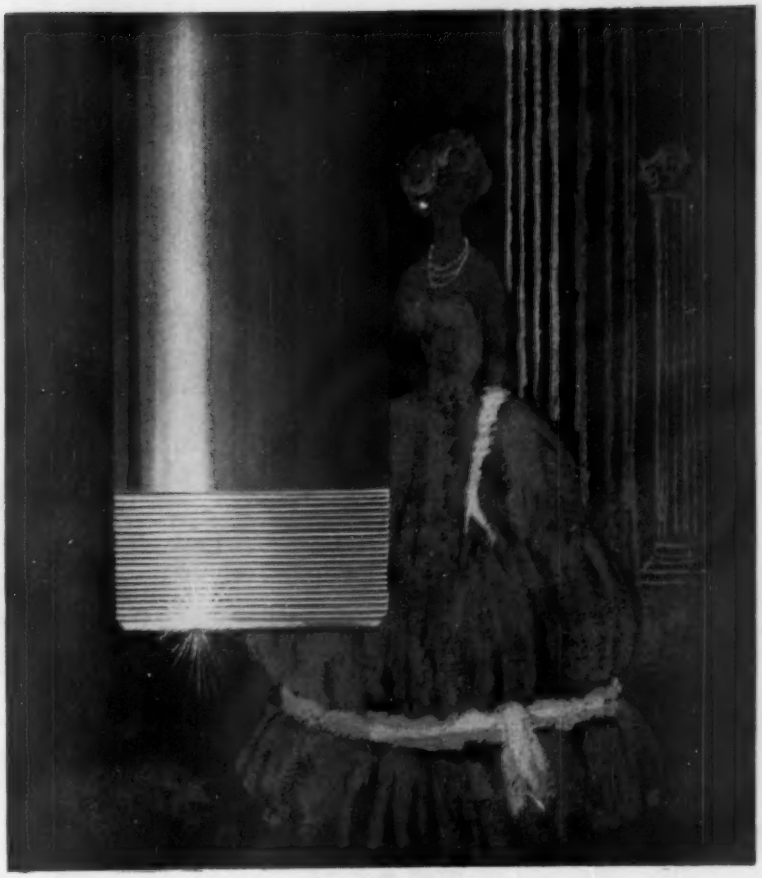
Ethylene oxide and ethylene glycol. The demand for ethylene oxide has pretty much been pacing the growth of surface-active agents and no particular shortage has shown up. But the big success of the synthetic fiber Tetron and the continued demand for polyester resins have placed ethylene glycol in critically short supply. Plans now call for expanding existing plants and building at least one new plant.

Styrene monomer and polystyrene. Polystyrene has been produced in Japan since 1957, but didn't experience much growth until domestic production of styrene monomer began in 1959. Presently, there are plans for expanding capacities of existing plants as much as 14,000 metric tons per year, and to build new plants with total capacities of 12,000 metric tons annually. By 1962, polystyrene demand is expected to reach 39,000 tons per year.

Styrene monomer production, which only began last year, got off to a slow start. But demand picked up rapidly as the plants of Japan Synthetic Rubber Co. and Japanese Geon Co. went into full-scale operation. Two new projects for styrene production have been proposed.

Aromatics. The demand for petrochemical aromatics is estimated to reach 70,000 metric tons this year and shortages are expected to show up in benzene, toluene, and xylene. The major consumers of benzene are the synthetic fiber (mostly nylon) plants and plastics. Toluene is in much demand as a solvent for the paint industry, and two new terephthalic acid plants furnish a big market for paraxylene.

Three new projects for producing aromatics from byproduct cracked tar are planned for the near future. The cracked tar is produced from thermal cracking of naphtha in olefin units.



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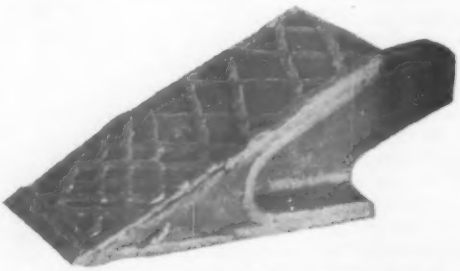
Elongation in 2"	55%	37.5%

Hardness—Single pass on manganese steel; as deposited—15 Rc; as work-hardened—48 Rc.
Two passes on manganese steel; as deposited—18 Rc; as work-hardened—48 Rc.



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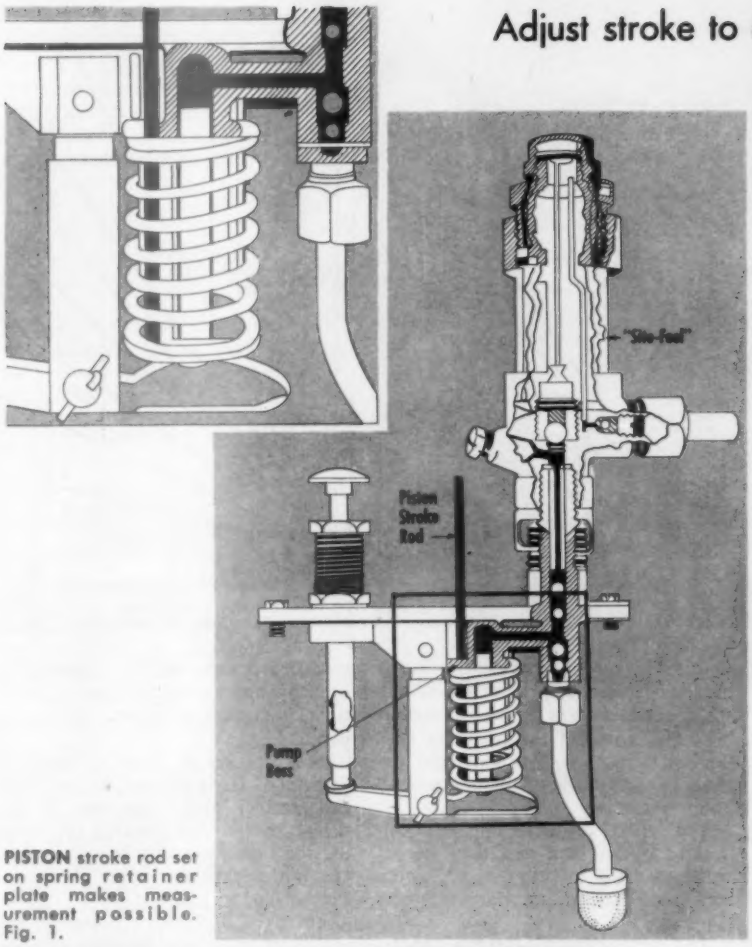
Adjust stroke to even oil flow for proper engine lubrication

This is the second of a three-part series on engine lubrication. It shows how oil pumps can be modified to correct inherent faults described in the first part (O&GJ, Dec. 5, 1960). The third part (O&GJ, Jan. 2, 1961), gives other steps that will help improve lubrication.

BY D. H. MOORE
Director, Operating Research,
Tennessee Gas Pipeline Co.



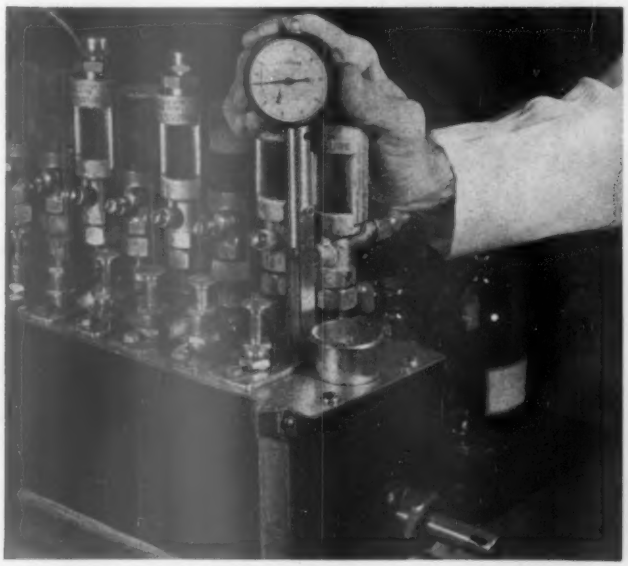
PISTON stroke rod set on spring retainer plate makes measurement possible. Fig. 1.

IT HAS BEEN NOTED that, in the "turns" method, most of the pumps increased or decreased the delivery rate in almost like amounts. This was not true of the "drop-counting" method.

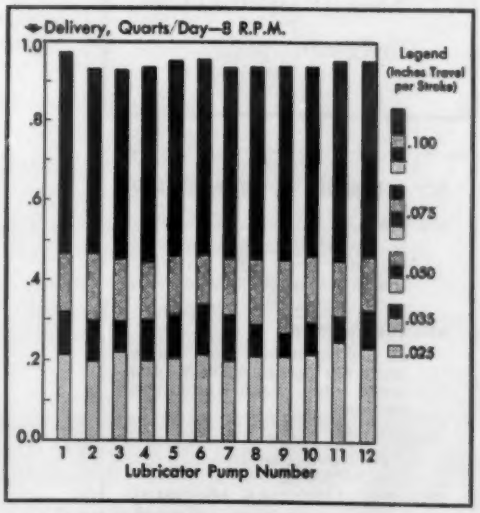
The delivery of a pump is a function of the cross-sectional area of the plunger, the number and length of the strokes and the efficiency of the pump. Knowing the plunger size and the r.p.m. of the lubricator shaft, it became necessary only to devise a means of measuring the length of the plunger stroke to get a delivery rate.

To accomplish this in the Type A,

Paper presented at CNGA fall meeting, Santa Monica, Calif.



DIAL INDICATOR, with adapters, is used to measure length of stroke. Fig. 2.



STROKE-MEASURING METHOD'S accuracy shows up in 11-pump test. Fig. 3.

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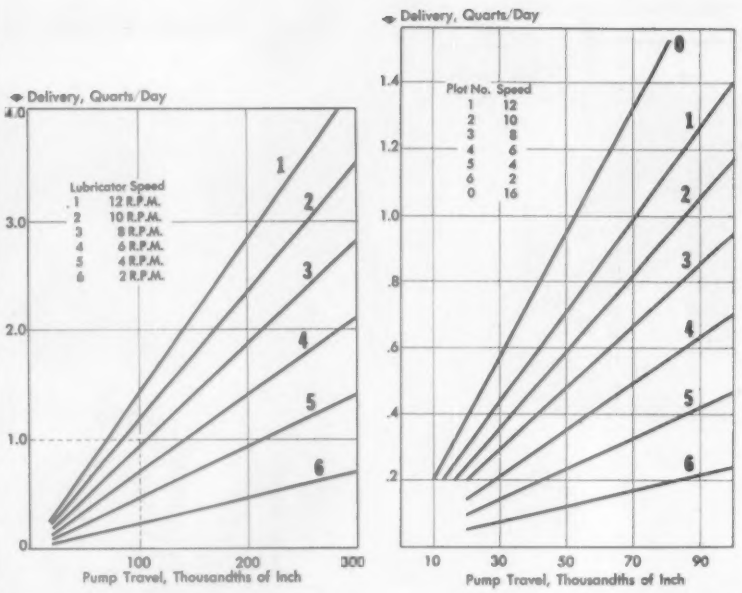
On the Job

PIPELINING



DELIVERY CHARTS show oil delivery versus pump travel at various r.p.m. Fig. 4.

Model 1 pump, a shaft (piston-stroke rod) is permanently attached to the spring-retainer plate (Fig. 1). A matching hole is drilled in the pump boss through which the stroking rod extends to the outside of the pump body upon reassembly.

The stroke of the pump in thousandths of an inch can then be set with the aid of a dial indicator equipped with appropriate adapters (Fig. 2).

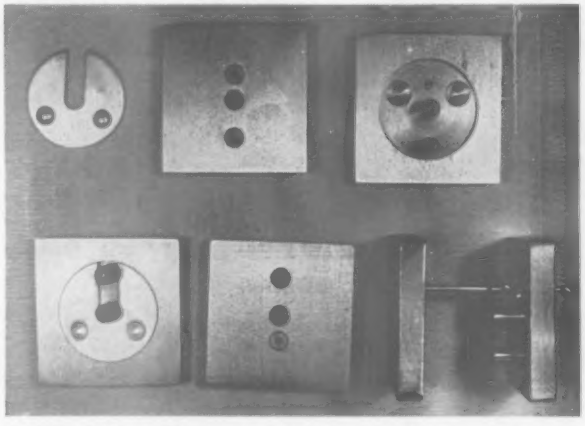
The accuracy of this stroke-measuring method on the Type A, Model 1 pump is shown in Fig. 3. These figures show the results of numerous test runs.

After completion of the test on the modified pumps, delivery charts (Fig. 4) showing delivery versus pump travel at various r.p.m. were prepared.

Modification of Type A, Model 3 pumps is accomplished by replacing the retainer plate with one of new design so that the stroking rod operates outside the spring and extends to the top side of the pump through a hole drilled in a screw.

On Type B, Model 1 pumps, it was necessary to reshape the retainer plate. It was then possible to extend the stroking rod up the outside of the spring through a drilled hole in the pump body. (Fig. 6).

This pump has a quick-action stroke



TEMPLATE AND DRILL sent to field for modification of Type A, Model 1 pump. Fig. 5.

with the pump plunger uncovering and then covering inlet and discharge ports. This plunger, traveling over the ports, becomes a measured travel on the stroking rod and the delivery-versus-pump stroke is out of balance. This was corrected by placing a check valve in the suction tube.

Type B, Model 2 pump, which also has inlet and discharge ports, requires a check valve between the sight glass and cylinder bore.

After laboratory tests were completed and delivery charts prepared, modification of the Type A, Model 1 pump was turned over to field personnel.

A drill template for the pump body, a jig for drilling the spring-retainer plate, an adapter for the dial indicator, drills, stroking rod, dial indicator and instruction book were shipped to each location. (Fig. 5).

This packet, with sufficient material to modify approximately 2,000 pumps, costs about $75. Approximately 10,000 pumps have been modified to date.

It is impossible and actually unnecessary to test each pump after modification. There is, however, a calibration method adaptable to the reservoir box.

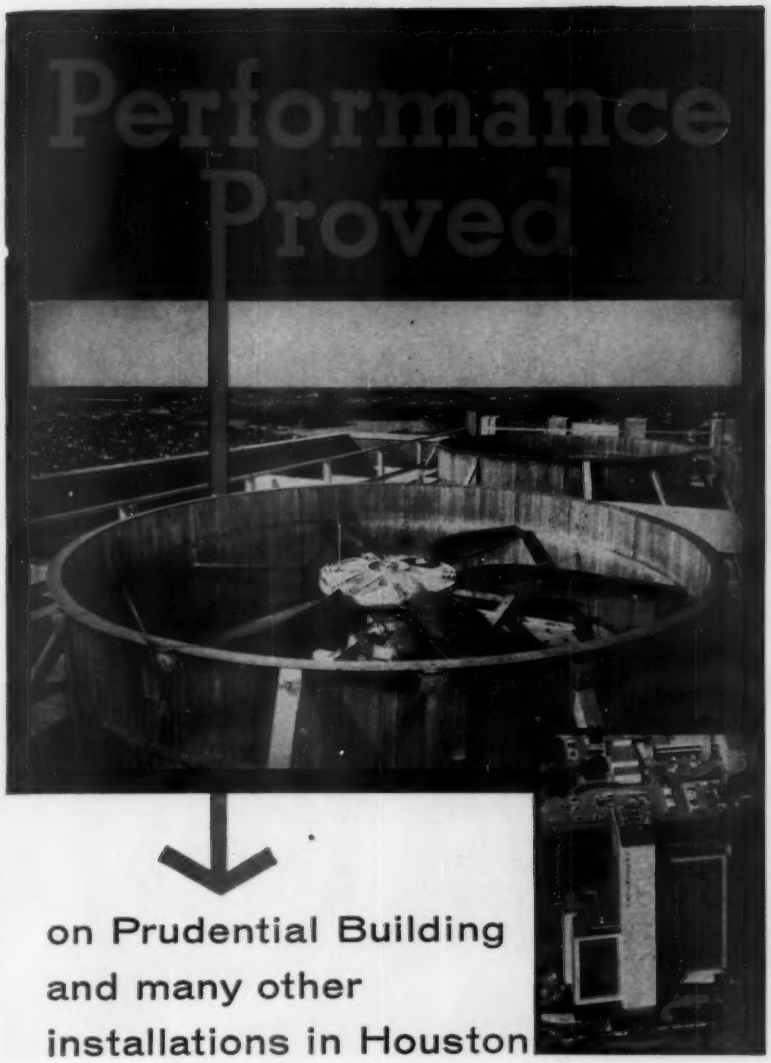
An accurate daily record of the makeup oil to the reservoir is kept for a week before the pumps are modified. After modification, each pump stroke is determined from delivery charts. The capacity of each pump is determined by dividing the average daily makeup by the number of pumps in the reservoir.

After modification, the actual daily makeup is checked against total calculated delivery determined from the delivery charts and the number of pumps. If the makeup is above or below, corresponding adjustments are made in the stroke of each individual pump.

The volume of makeup oil was not changed at the time the modified pumps were put into service. The object of the modification was a more equitable distribution rather than a reduction in rate of consumption. The latter may be expected depending on operating experience.

The pumps which have been modified have been in service for more than 15 years. They were probably not accurate when new and their efficiency differs from pump to pump because of wear.

Calibrating the reservoirs and setting the stroke to match the daily makeup will definitely give a more equitable distribution of the oil to the lubrication points. Checking the stroke with a dial indicator is a fast and sure method.



on Prudential Building
and many other
installations in Houston

Throughout Houston, the air conditioning capitol of the world, and the Gulf area, Hartzell cooling tower fans are being used in many commercial and industrial installations such as the one on top of the Prudential Building.

This 14′, 6-blade assembly is operating in an induced draft tower and has given *completely trouble-free service during its 6½-year life time.*

Here is another example of the kind of *service and long-life bonus* many owners of Hartzell fans have welcomed in their cooling towers and heat exchangers in the Houston area. Whatever your requirements for large diameter fans and cooling capacity, Hartzell has the fan to do the job.

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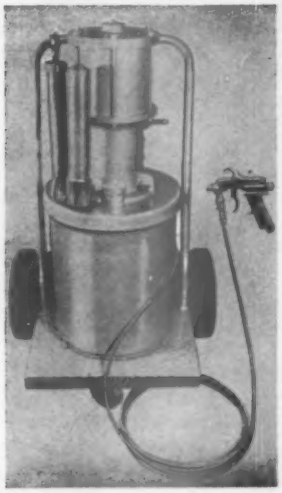
▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .



Airless spray-painting

. . . system now available is designed to take advantage of the total atomization of the maker's H-Gun recently developed. The system features a new high-pressure reciprocating pump designed for airless spraying, called the Atlas II.

A 5½-in. air motor of balanced design powers the long-stroke pump. Providing a 30-to-1 ratio, the pump develops operating pressures up to 3,000 psi. The maker reports that the pump will handle up to four paint guns, either manual or automatic types.

The Hydra Airless 30 spray system can easily handle materials which normally cannot be sprayed, the maker claims. The spray system comes in heated and unheated models and in fixed and portable types with capacities of 10 and 50 gal. Source: **Spee-Flo Co., 6614 Harrisburg, Houston 11, Tex.**

●

Valve with O-ring seal

. . . for tight shutoff, the Series 900, comes in three configurations, all with a right-angle shape for easy mounting: single inlet and outlet, single inlet and two outlets, and two inlets and one outlet. Of stainless-steel construction, the valve provides an operating-temperature range from −40° to 450° F. and an operating-pressure range from 0 to 6,000 psi.

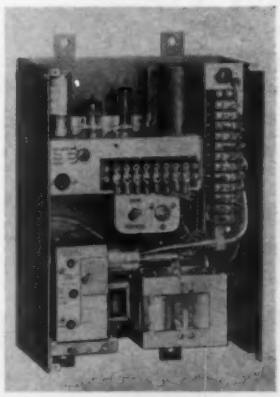
The O-ring material may be Buna N, neoprene, or Viton A. Source: **Circle Seal Products Co., Inc., 2181 E. Foothill Blvd., Pasadena, Calif.**

●

Color-coded unions

. . . make it easy to identify the seat type and coupling threads without taking them apart. The unions are colored by electroplating. The seats in the union head piece are identified by one of five colors, the coupling nut threads are identified by one of four colors, and the seats in the tail pieces are identified by one of three colors. Source: **Catawissa Valve & Fittings Co., Catawissa, Pa.**

●



Newest analog computer

. . . is designed to perform any one of three mathematical functions common to process control: extract the square root of a single input or ratio, or multiply two inputs from one of the maker's primary transmitters. The output signal is the analog value for the given mathematical function. It can be used to directly operate one of the maker's recorders, indicators, or controllers.

The C4A/2 computer is claimed to permit electronic instruments to be used for many control functions that normally require pneumatic systems. Source: **Swartwout Div., Crane Co., Hooksett Industrial Park, Manchester, N. H.**

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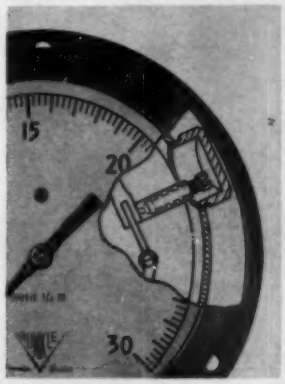

Gage equipped with bleeder

. . . recently developed permits removal of air from sealed, gage-equipped systems. According to the maker, the device allows purging of gases, permitting them to function with prompt response in low-pressure ranges where the diaphragm spring effect must be minimized; or in high-pressure ranges where diaphragm travel is limited.

The device is an integral part of the Bourdon tube tip and is accessible from outside the gage case. Source: **Kunkle Valve Co., 121 S. Clinton, Fort Wayne, Ind.**

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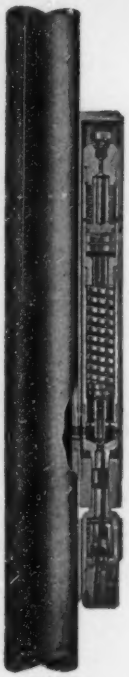
GAS LIFT AUTOMATION

with Macco "Spring" Fluid Operated Valves
("No Charge" Bellows)



CM2-FS

The MACCO Fluid Operated Valve is actuated by a predetermined hydrostatic fluid head in the tubing.

INTERMITTENT FLOW... The intermittently produced gas-lift well normally has a producing capacity of less than 500 bbls. per day and fluid is produced at intervals in "slugs." When the fluid column in the tubing builds up sufficient pressure, at the valve, to overcome the valve opening pressure, the valve stem is lifted off its seat. Then gas from the casing is injected through a normally closed check valve into the tubing, discharging the accumulated head of fluid.

When the tubing pressure opposite the valve becomes lower than the valve opening pressure, the valve immediately closes until another predetermined head is built up in the tubing and the cycle is repeated. Subsequent action is automatic and unloading from valve to valve is automatic. No time cycle surface controllers or "purgers" are necessary.

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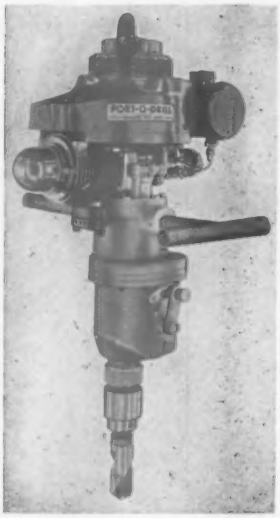


Engine-powered drill

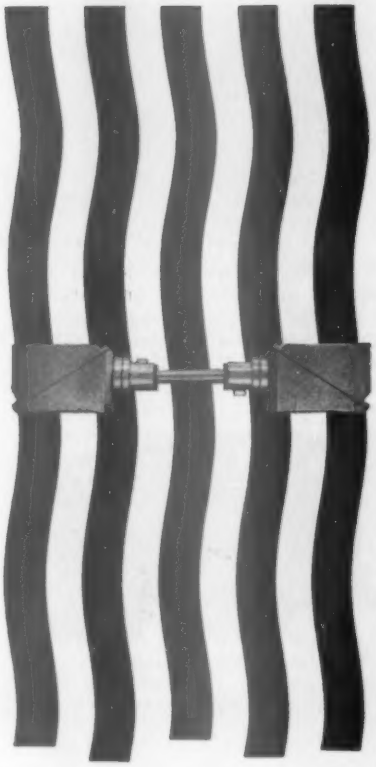
. . . promises to handle a variety of drilling chores. A self-contained 2.2-hp., two-cycle, air-cooled gasoline engine with a pressurized fuel tank powers the Port-O-Drill unit. According to the maker, the portable tool can be used continuously at any angle, indoors or outdoors.

Total weight: 30 lb. Over-all height: 24 in. The maker says one man can handle the drill in nearly any position desired. The unit has a recoil type of starter and a shielded spark-plug cover to prevent shock. Source: **Schnacke Mfg. Corp., 1016 E. Columbia, Evansville 7, Ind.**

●

Pipe, cable joined fast

. . . with a new clamp just made available. It consists of a high-conductivity bronze body equipped with a chain and speed-screw for attaching to pipe. The clamp handles pipe sizes of 2 in. and larger. Anticipated uses included arc welding of pipe, cathodic-protection pipe measurements, and temporary electrical connections to pipelines. The maker says the clamp will handle 300 amp. easily. Source: **Pipetron Co., 12926 Saticoy, N. Hollywood, Calif.**



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Automatic message-relay

... set has been developed. The Model 28 RT (reperforator transmitter-distributor) is a high-capacity, self-contained, punched-tape message-relaying facility. It is designed for receiving wire signals at speeds ranging from 60 to 200 words per minute, converting them into perforations in paper tape, and transmitting them at the same or another speed to local or remote receiving stations. Source: **Teletype Corp., 4100 Fullerton, Chicago 39, Ill.**

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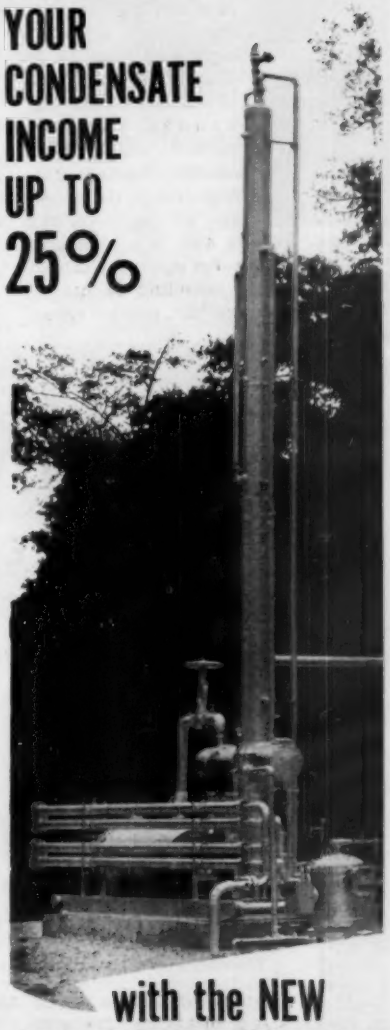

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Solenoid valves

...a direct-acting type in a new line for general service come in eight sizes from ⅜ to 2½ in. The Type MDW valves are bronze, two-way packed, and spring-loaded. Pressure ratings range from 40 psi. for the ⅜-in. size to 4 psi. for the 2-in. size. Features include full-pipe-area orifices, solenoid protection, and mounting in hinged electrical knockout box, molded epoxy coils, and renewable composition disks. Potential uses include vacuum exhaust lines, drain lines, and tank-level and supply control. Source: **J. D. Gould Co., 4707 Massachusetts Ave., Indianapolis 18, Ind.**

●

Steel-drum conveyor

...on the market provides a way to move, store, and sort drums. It offers a way to obtain off-the-floor travel for drums, reduce traffic problems, and reduce handling labor, compared with conventional methods.

Loading and unloading can be either automatic or manual. According to

the maker, the conveyor system is adaptable to handling of any article of uniform size and shape. Source: **General Automatic Transfer Co., 911 Craig, Kirkwood 22, Mo.**

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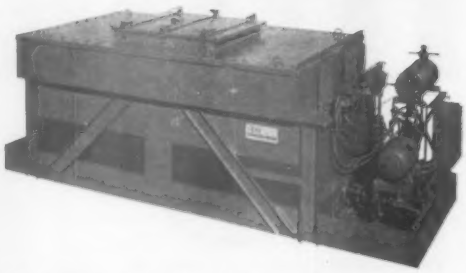

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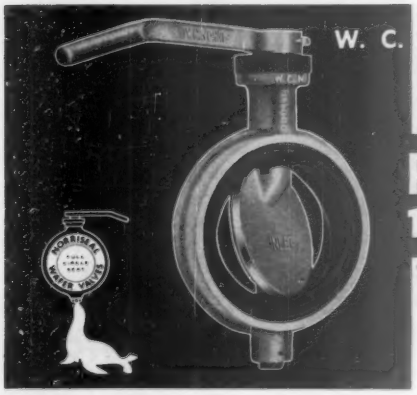

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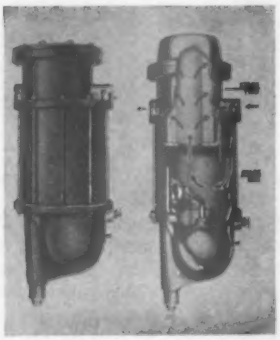
VALVES



Air filter does two jobs

. . . to eliminate oil and oil fumes from compressed-air lines. In a two-stage action, it both separates and filters the incoming air. In addition, the Arid-Air filter has an internal float-drain mechanism. The float operates a pilot air valve to a large piston which opens the drain for pressurized discharge. The unit comes in ½ to 2-in. sizes. Pressure drop is reportedly guaranteed by the maker to be less than 3½ psi. at a flow rate of 100 c.f.m. Source: **Wilkerson Corp., 1595 W. Girard Ave., Englewood, Colo.**

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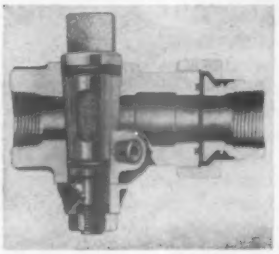


Service lines isolated

. . . from house piping with a new insulating union outlet now offered on a line of gas-meter stops. The combination meter stop and insulating union offers a practical method to isolate service lines from house piping. Maximum working pressure of the LubOseal and Tamperproof stops is 125 psi. Continuous operating temperature range is −20° to 150° F. The stops are an iron-body, bronze-key, straight-way, solid-head type available in ¾, 1, and 1¼-in. sizes. Source: **Meuller Co., 512 W. Cerro Gordo, Decatur, Ill.**

●

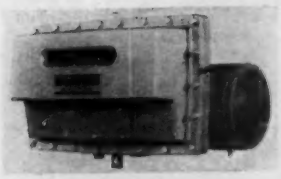
Catalyst for dealkylation

. . . in general and more specifically for converting toluene to benzene is now being produced. Tradenamed C30, it is a chromia-alumina type on a special grade of alumina. Source: **Catalyst & Chemicals, Inc., Box 86, Louisville 1, Ky.**

High-pressure flange gasket

. . . in a new series is being produced. The Series 6400 Gask-O-Seal gasket can be used with most ASA flanges, the maker says. Suitable flange types include raised and flat-face, lapped-joint, and welding neck, and slip-on screwed joints, and fitting flanges.

The maker says the gaskets can be reused and are easy to install. They are recommended by the maker for temperatures from −65° to 275° F. Source: **Parker Seal Co., 10567 Jefferson Blvd., Culver City, Calif.**



LBG mass flowmeter

. . . can be obtained now that is designed to simplify the measurement of LPG. The meter is said to be unaffected by the hazards of flashing.

Flow in pounds is totalized on a counter with a reported accuracy of

The New
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COMPENSATES
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With the new ARCCO-Anubis RD-B Gas Gravitometer you get a highly accurate record of the specific gravity of gases... fully compensated for changes in barometric pressure as well as changes in temperature and humidity. It employs two columns; one for gas, one for "dry air." The difference in weight between the "dry air" and the gas in these two columns is measured and recorded in terms of specific gravity. A floating lever attached to the unit of a 6" aneroid barometer assures that the recorded gravity will always be corrected for barometric pressure changes.
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±1%. An angular-momentum principle is used which is said to eliminate any rotating parts that could be destroyed by the high velocities occurring during flashing. The meter currently comes in four ratings, from 0-to-20,000 to 0-to-240,000 lb. per hour. Source: **General Electric Co., Schenectady 5, N. Y.**

●

Latest rotary pump

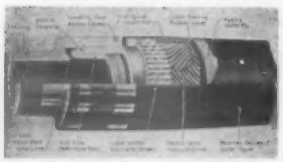
. . . is designed for use in pumping chemicals, thin and viscous products, and both lubricants and nonlubricants. Rotors driven by steel external pilot gears move the liquid. Ball bearings located outside the pumping chamber support the shaft.

The HJ Series pump comes in four models for handling liquids with viscosities from light to 50,000 S.s.U. and capacities from 70 to 300 g.p.m., horsepower ratings from 14 to 18 hp., and operating speeds from 450 to 1,075 r.p.m. Source: **Waterous Co., 80 E. Fillmore Ave., St. Paul 7, Minn.**

●

High-pressure rotary hose

. . . on the market is pretested to 7,500 psi. and is claimed to give considerably more burst resistance than older types. The Gold Stripe rotary



hose is pretested to 50% in excess of the 5,000-psi. Class C API test.

The hose is constructed of high-tensile-strength steel cable, a heavy fabric reinforcement, and an oil-resistant synthetic-rubber tube. Available sizes: 2½ to 4-in. i.d. Source: **Thermoid Div., H. K. Porter Co., Inc., 200 Whitehead Rd., Trenton, N. J.**

●

Snubber for draft gages

. . . is designed to provide a snubbing action that prevents damage to and excessive wear in sensitive gages. Maximum working pressure of the snubber is 5,000 psi.

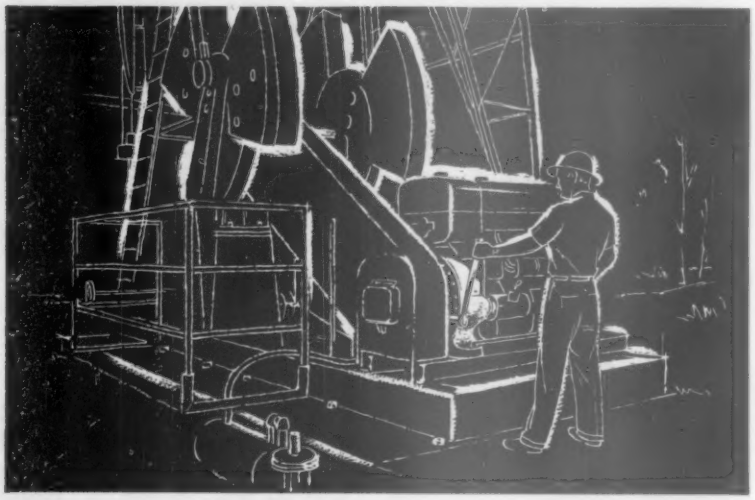
Variations in snubbing action are accomplished by the selection of one of various combinations of three stainless-steel pins. Each pin has a different diameter. The snubbing chamber is located on the side. This permits the changing of pins without disrupting line connections.

The snubber is made of forgings of brass and stainless steel in sizes of ¼ and ½-in. internal pipe threads. Source: **Republic Mfg. Co., 15655 Brookpark Rd., Cleveland 35, Ohio.**

●

Solid-teflon spheres produced

. . . to serve as spacer or filler material in maintaining a specified volume of liquid in a container. The spheres come in several diameters. Potential applications include use in oil-filled circuit breakers and transformers to control liquid volume. Source: **Garlock, Inc., Camden 1, N. J.**



DEPENDABLE PUMPING

with Rockford Power Take-Offs

It's no wonder why more and more oil men specify Rockford PTO's. These maintenance-free PTO's offer higher torque capacities, better heat dissipation, less lever pressure, and positive engagement. Rockford's infinite-control adjusting ring provides longer life. Smooth and instantaneous power is transmitted from any internal combustion engine to your working oil field equipment.
Write today for illustrated brochure.

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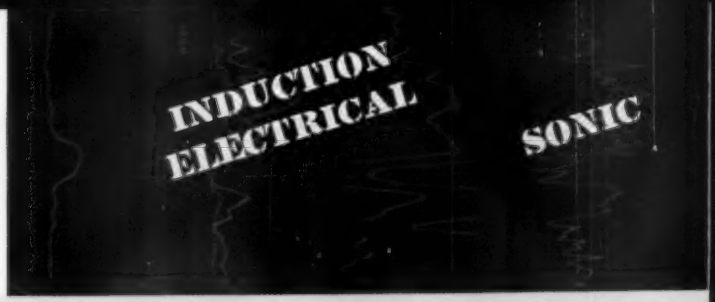


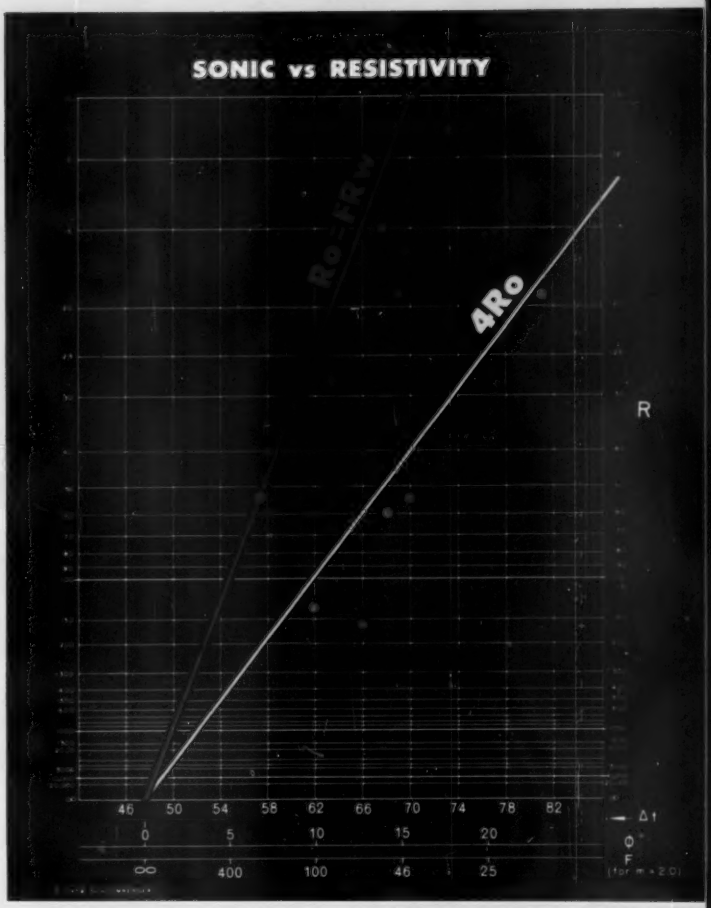
Schlumberger Sonic and Resistivity Logs Simplify Oil Finding!

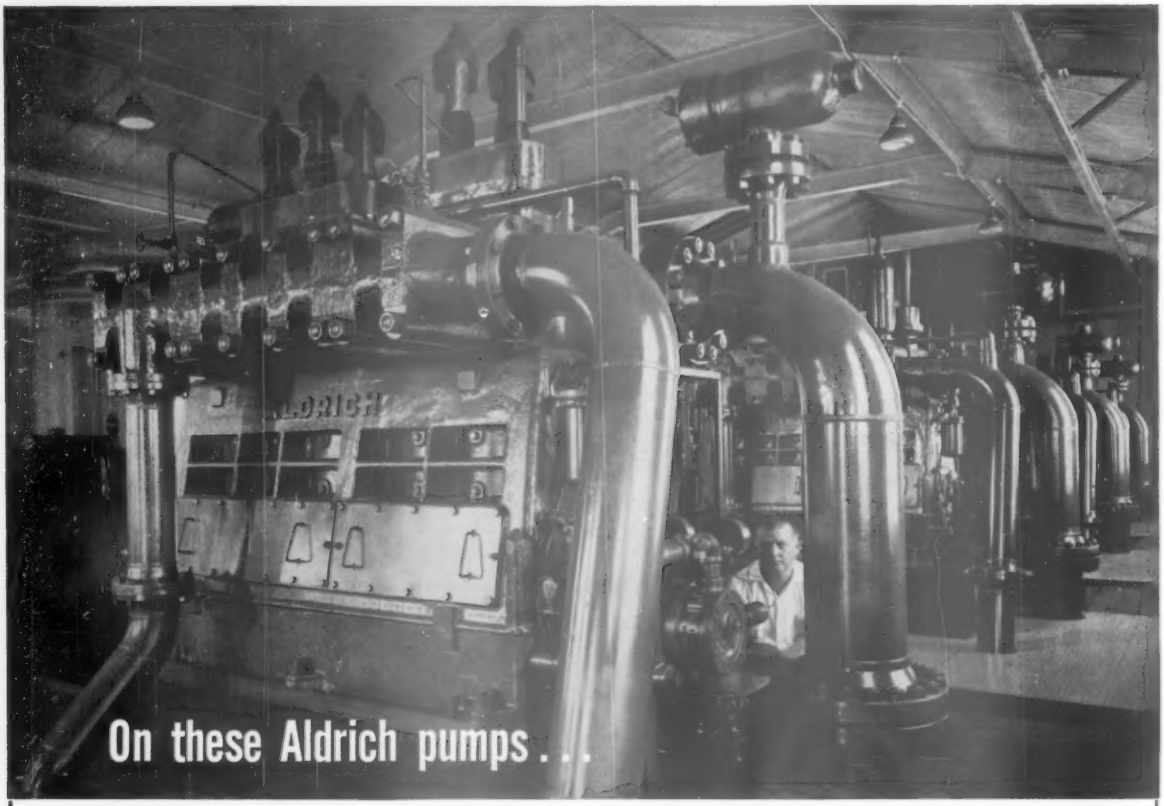
Oil and gas horizons are graphically identified by simple comparisons of Sonic and Resistivity data. These fast methods of interpretation are appropriate for well-site application. Potentially productive zones thus found can be further investigated by quantitative methods—or can be checked by sidewall cores and formation tests.

Ask a Schlumberger engineer in your area to demonstrate the benefits you can derive from Sonic and Resistivity Logs in your well program.

THE EYES OF THE OIL INDUSTRY®

SCHLUMBERGER





GULF OIL REPORTS 6 YEARS OF CONTINUOUS SERVICE WITH MINIMUM MAINTENANCE

FIELD REPORT

FLOOD: Goldsmith-San Andres Unit
OPERATOR: Gulf Oil Corporation
PUMPS: 4 Aldrich Quintuplex
FLOODING STARTED: October, 1954
EXPERIENCE TO DATE:

After six years, three pumps operate 24 hours a day, delivering some 54,000 bbl/day of sour oil field brine at 750 to 800 psi. Station designed for automatic operation. All maintenance handled by one man during eight-hour work day.

Field Parts stock available in Houston, Odessa, Alice and Wichita Falls, Texas; Casper, Wyo.; Hobbs, N.M.; Carmi, Ill.; Charleston, W. Va., Tulsa, Okla.; Los Angeles, Calif.; Calgary, Ontario. For further information write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the tough pumping problems go to ALDRICH

SHOWCASE . . .

New Literature

Determine micron contamination

. . . and submicron contamination in fluids by two methods described in a new 12-page report. Both methods are based on filtration of a sample to be tested through a membrane filter, a plastic microporous material with micron-sized holes. Contamination and dirt are collected on the filter surface and may then be counted and sized microscopically. The manual describes procedures using both transmitted and reflected light. Source: **Gelman Instrument Co., 106 N. Main St., Chelsea, Mich.**

Door interlock switches

. . . with thermoplastic actuating rods are detailed in new two-page Data Sheet 178. The three series of switches described are designed for use as safety devices on hazardous electronic equipment. On a service door they automatically cut power when the door is opened, enabling personnel to test or repair the equipment in safety. The data sheet includes photos, mounting-dimension drawings, mechanical characteristics, electrical ratings, and pricing information. Source: **Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.**

Heat-transfer, process equipment

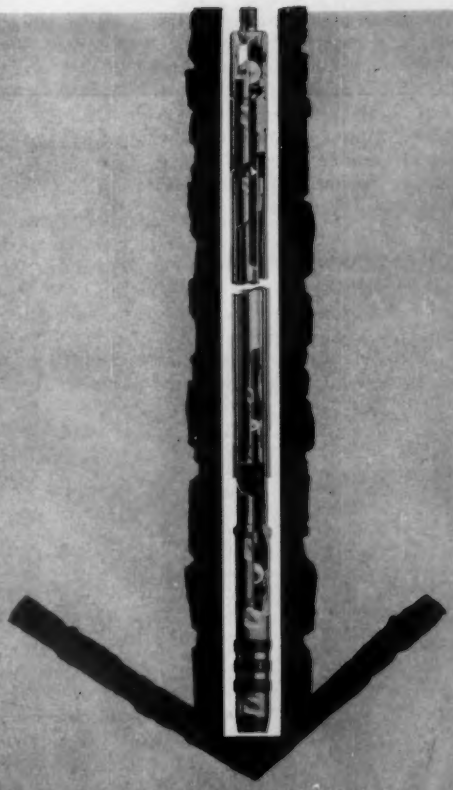
. . . are illustrated in new four-page Bulletin 51, just made available. It describes storage-water heaters, instantaneous heaters, and hot-water converters plus specially engineered heat transfer and process equipment such as brine coolers, organic vapor condensers, welded-steel heat exchangers, and pressure vessels. Source: **Niagara Weldments, Inc., 55 Portage Rd., Niagara Falls, N. Y.**

Capacitance level controls

. . . called Prob-A-Larm are detailed in a new six-page bulletin just announced. It presents complete mechanical and electrical data, descriptions and drawings of typical applications, and ordering and price information. Source: **Weighing & Controls, Inc., Industrial Park, Hatboro, Pa.**

Welding-electrode chart

. . . presently being offered free is a 23 by 35-in. wall chart that gives description, number, color code, mechanical properties, size, current range, procedure and application information on arc-welding electrodes.



PUMP SAND-LADEN OIL WITH A HARBISON-FISCHER 3-TUBE ROD PUMP

If you are pumping a recently-fractured well, or from a formation with unusually high sand-laden fluid, a Harbison-Fischer 3-Tube Rod Pump, because it can handle sand and other entrained solids that cause trouble in other pumps, may solve your pumping problems once and for all.

The pump consists of two concentric, loose-fitting tubes (plunger and jacket tube) which telescope over and in a third, stationary tube that serves as the pump barrel. Well fluid in the annular spaces between the three tubes packs off and compensates for the loose fit.

This "fluid seal," the loose-fitting plunger, and a small plunger bore combine to produce sandy fluid efficiently . . . a high-velocity discharge at the bottom of the pump flushes sand into the fluid column after shut-down periods and keeps it in suspension; there's no plunger sticking or galling due to sand in the fluid, and no plunger wear or strain on the rod string.

There are other features, too . . . a no-go ring to position the pump in the seating nipple so that sand accumulation is insufficient to sand in the pump, standard-sized A.P.I. balls and seats, and many more that make the H-F 3-Tube the Best Pump in the Oil Patch for sand, or as an all-round pump.

If sand is a problem with you, find out the advantages of an H-F 3-Tube Rod Pump. Ask your store or one of our 70 field men for details, or write us at P. O. Box 2477 in Fort Worth for literature. No obligation, of course.

HF

HARBISON-FISCHER

FORT WORTH

Other welding information on the chart covers welding symbols, welding arc, causes and cures of common welding troubles, typical deposition rates, and a metal-hardness conversion table. The chart is tinned top and bottom with double hangers at the top. Source: **Hobart Brothers Co., Hobart Square, Troy, Ohio.**

Tubingless-completion

. . . folder explains how new equipment is used for completions which use tubing for small-diameter casing. Eight-page folder 378 is divided into three sections: primary cementing, remedial and stimulation, and completion and production. Source: **Baker Oil Tools, Inc., Box 2274, Terminal Annex, Los Angeles 54, Calif.**

Prevent paraffin buildup

. . . on metal surfaces in wells with the help of Depban, as explained in a new two-page product data sheet just made available. According to the literature, the product forms an oil-repellent coating on metal surfaces to inhibit the deposition of paraffins or asphalts, thus preventing thick accumulations which interfere with production. Included is data on advantages, physical properties, use, lab tests, case histories, and packaging and availability. Source: **Dowell Division of The Dow Chemical Co., Box 536, Tulsa, Okla.**

Algebraic-compiler manual

. . . a self-teacher, promises to help you to master the Bendix G-15 ALGO compiler. The 32-page manual describes the language of ALGO and sets forth procedures for the representation of numerical data and control statements. Step-by-step examples illustrate the principles and operational characteristics of the compiler. Source: **Computer Div., Bendix Corp., 5630 Arbor Vitae St., Los Angeles 45, Calif.**

Alloy-chain slings

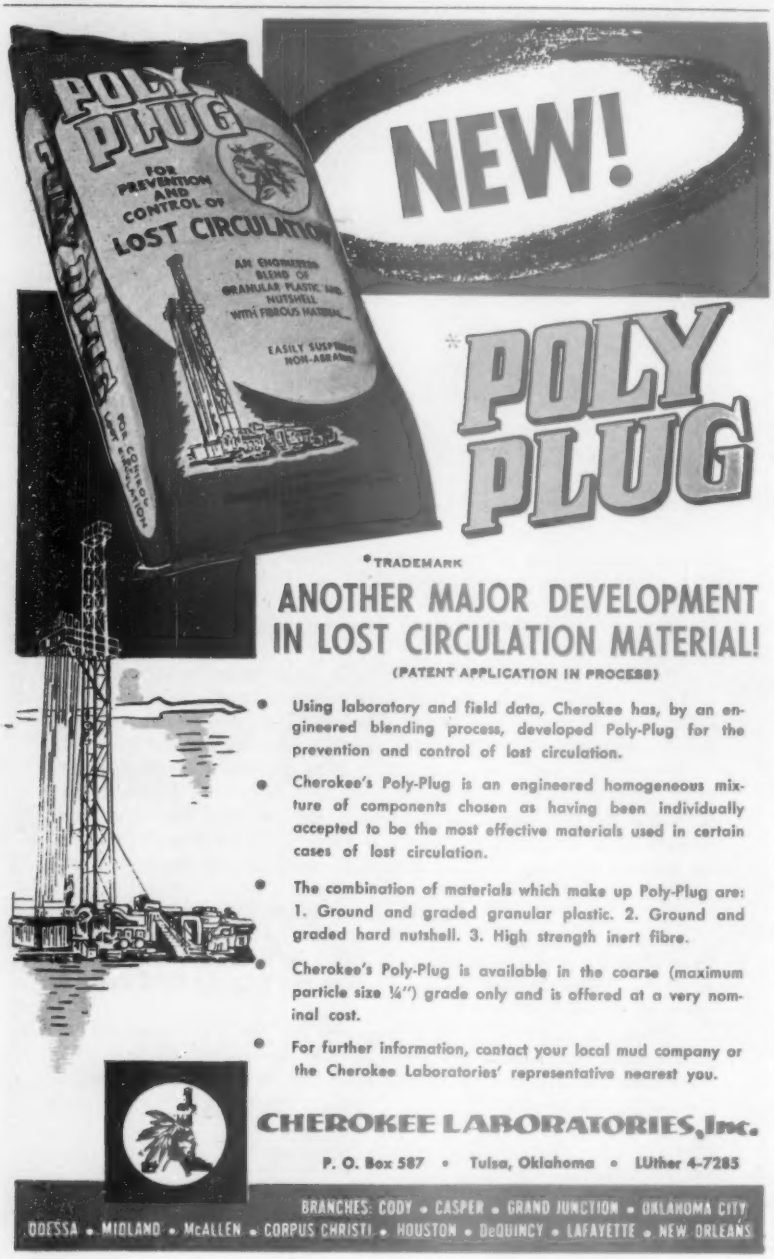
. . . rings, links, and hooks—said to provide a high degree of safety in lifting—are illustrated in a 16-page brochure which gives specifications and working-load limits. The new literature describes the advantages of alloy-chain slings over wrought-iron or carbon-steel chains, and features the design advantages of Jallink, new tamper-proof alloy-chain-connector link. Included is data on how to use and maintain chain slings and their attachments, along with four points of a good periodic inspection program and the danger signals to look for in a link-by-link inspection. Source: **Wire Rope Div., Jones & Laughlin Steel Corp., Muncy, Pa.**

Oil-field chemicals

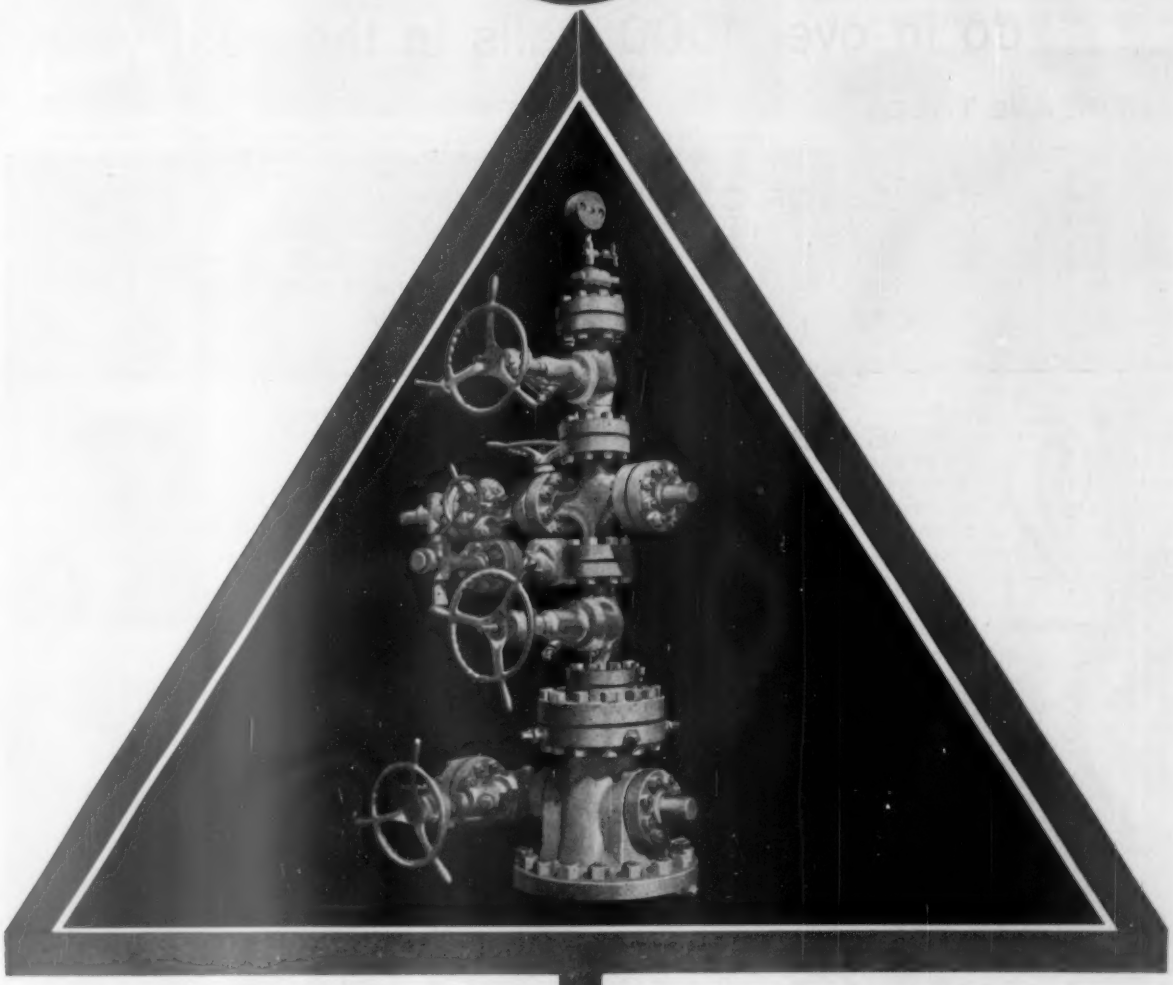
. . . for controlling paraffin, emulsion, and corrosion are presented in a new 1-page pamphlet just made available. Described are (1) PTC paraffin-treating chemical; (2) D-7, DS-8, and DP-10 demulsifiers; (3) Stim-Form formation-treating chemical; (4) CI-123 corrosion inhibitor; (5) GS-20 gyp and scale treatment; and (6) an antiseptic hand cleaner. Source: **BrakeSol, Inc., Box 9506, Oklahoma City, Okla.**

Chemical analysis of carbon

. . . alloy, and stainless tubing steels for tubing and pipe for corrosion-resistant service or elevated temperature and/or pressure service, is contained in new Bulletin T-456. It's crossindexed to associate grade and ASTM specifications with Nicloy Croloy, and specialty-tubing steels. For ready reference, the bulletin lists the ASTM tubing and pipe specifications by number and title. Source: **Tubular Products Div., Babcock & Wilcox Co., 712 Eleventh St., Beaver Falls, Pa.**


POLY PLUG
FOR PREVENTION AND CONTROL OF LOST CIRCULATION
NEW!
POLY PLUG
*TRADEMARK
ANOTHER MAJOR DEVELOPMENT IN LOST CIRCULATION MATERIAL!
(PATENT APPLICATION IN PROCESS)
Using laboratory and field data, Cherokee has, by an engineered blending process, developed Poly-Plug for the prevention and control of lost circulation.
Cherokee's Poly-Plug is an engineered homogeneous mixture of components chosen as having been individually accepted to be the most effective materials used in certain cases of lost circulation.
The combination of materials which make up Poly-Plug are: 1. Ground and graded granular plastic. 2. Ground and graded hard nutshell. 3. High strength inert fibre.
Cherokee's Poly-Plug is available in the coarse (maximum particle size ¼") grade only and is offered at a very nominal cost.
For further information, contact your local mud company or the Cherokee Laboratories' representative nearest you.
CHEROKEE LABORATORIES, Inc.
P. O. Box 587 • Tulsa, Oklahoma • LUther 4-7285
BRANCHES: CODY • CASPER • GRAND JUNCTION • OKLAHOMA CITY
ODESSA • MIDLAND • McALLEN • CORPUS CHRISTI • HOUSTON • DeQUINCY • LAFAYETTE • NEW ORLEANS

ORBIT VALVES®



WE'D LIKE TO BE . . . ON

YOUR CHRISTMAS TREE

This is the season in which to remember . . . and be remembered.

Orbit Valve Company's personnel — wherever they may be — appreciate the opportunity of serving a truly great industry during this year and the many years of the past.

We sincerely wish a Happy and Prosperous New Year for everyone throughout the oil industry.

ORBIT VALVE COMPANY • TULSA, OKLAHOMA

Trinity Lite-Wate Cement

has done what the operator set out to do in over 1500 wells in the past year.

HERE ARE THREE:

1

ECTOR COUNTY, TEXAS

Cemented 3,383 feet, 4½-inch casing. Slurry weight 12.5 to 12.7 pounds. Tailed in with 13-pound slurry. TRINITY LITE-WATE all the way. Job successful.

2

ST. CHARLES PARISH, LOUISIANA

Cemented 9⅝-inch surface casing in 15-inch hole, badly washed out. 12.5-pound slurry returned to 25 feet from surface, using 13.5-pound slurry for tail in. Nippled up after 12 hours... drilled out of 9⅝" in 26 hours... tested with 3500 lbs. per square inch. TRINITY LITE-WATE all the way. Job successful.

3

TERRELL COUNTY, TEXAS

Cemented 13,752 feet of 7-inch casing. Used TRINITY LITE-WATE cement 12.7-pound slurry with .8% LWL 20% Silica Flour. Brought cement back to 5,484 feet in one stage for fill up of 8,268 feet. Tailed in with INFERNO and 4% Gel. Job successful.

In the range of lightweight cement slurries, TRINITY LITE-WATE produces a slurry which is:

1. Sulfate resistant for lasting casing protection.
2. Remains impervious to migrating fluids.
3. Light enough to circulate.
4. Strong enough for any casing seat.
5. Strong enough to permit hydraulic fracturing.
6. Easy to mix, easy to pump.

TRINITY LITE-WATE can be used in most wells by just adding water. For special conditions it is compatible with accelerators, retarders, LWL agents and some other additives. For complete laboratory data call your local Trinity Representative or write Dallas Office, P. O. Box 2698 or phone RIverside 2-8111.

75 lb. Dry Volume per cubic foot

TRINITY

PORTLAND CEMENT DIVISION

GENERAL PORTLAND CEMENT COMPANY

GP CC

DALLAS·FT.WORTH·HOUSTON

▶ ▶ ▶ Equipment Men Notes

PANORAMIC VIEW of American Iron & Machine Works, Inc.'s new rod and liner plant in Oklahoma City shows the new electrically controlled Micro-Matic honing machine at the left. In the center is a new automated electronic induction hardening machine designed and built exclusively for American Iron.

National Supply Co. names four

. . . new regional managers—L. A. J. Monroe, southern; Robert D. Stottlemyer, northern; William D. Crawford, eastern; and Jerry L. Evans, western.

L. A. J. Monroe

R. D. Stottlemyer

Monroe joined National Supply in 1945 at the Shreveport store. He has served as store manager at El Dorado, Ark. and Kilgore, Tex., and as a city salesman in New Orleans. He was district manager at New Orleans from 1951 until his appointment as assistant to the vice president at Houston this year.

W. D. Crawford

J. L. Evans

Stottlemyer started with the company in 1946, serving at Toledo and Houston. He became division engineer of the northwest division in 1948, rising to division sales manager in 1950, assistant division manager in 1952, and division manager in 1955.

Crawford joined the company in 1938 at Clay City, Ill., He was promoted to a district managership in 1954, and has served as division manager of the eastern division since 1957.

Evans, who started in 1922, has worked in stores at Brea, Bakersfield, Santa Fe Springs, and Taft, Calif. He was named store manager at Long Beach in 1928, was made district manager at Torrance in 1938, and has been division manager of the western (formerly California) division since 1940.

Grove Valve & Regulator names

. . . J. D. McNeill as a sales engineer for pipeline and production valves and pressure regulators in Canada. Locating in Calgary, McNeill will assist Morley Davies, who directs Grove's Canadian sales activities. The newly appointed sales engineer has been with National Supply Co., Ltd., in a sales capacity. Previously he was with Amerada Petroleum Corp.

Cooper-Bessemer Corp. names

. . . John O. Fighter to the International office in New York City, reports Charles G. Cooper, international director. Replacing Fighter as branch manager of the office in Anaco, Venezuela, will be W. R. Bohannan, forferly a sales engineer at the corporation's Caracas, Venezuela, branch office.

J. O. Fighter

W. R. Bohannan

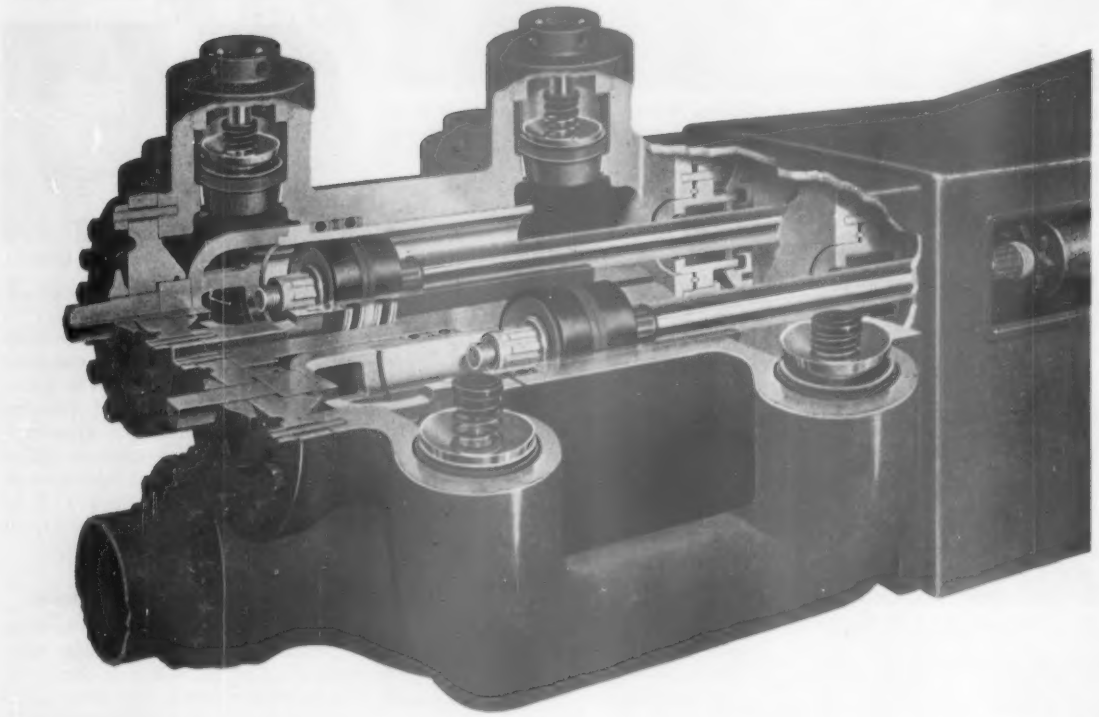
Fighter has been with C-B since 1955 when he joined the company as a sales engineer. He was transferred to the International Division in 1957, then joined the sales-engineering staff in the Caracas office and received the Anaco appointment in 1959. Bohannan joined C-B in 1951 as a sales engineer in the Mount Vernon, Ohio, office.

Continental-Emsco announces

. . . two personnel changes in its tubular department. Joe T. Gailus, manager of line pipe, will now also be in charge of nonferrous-pipe sales. Gailus has served C-E as a special representative, salesman, clerk, assistant district manager of tubular sales, and

PIPE COATING, WRAPPING MACHINE was viewed in Tulsa recently by about 50 engineers from pipeline construction and operating companies. Midwestern Pipe Line Products Co., of Tulsa, is distributor for the machine, which is manufactured by Betzel Co., of Arlington, Tex. The new 4,000-lb., self-contained, portable unit, which hooks on the back of a car or light truck, is designed for easy mobility in onsite application of piping coating and wrapping materials. The machine reportedly can be set up and in use in less than an hour, and can process up to 20,000 lineal feet per day with only 10-minute breaks to switch pipe sizes.

The "Inside Story" of the Heart of Your Rig



This cutaway view of a mud pump shows where the vital Mission fluid-end parts fit and why they are essential to correct operation. Forces on these parts are staggering. For example, pistons and rods may be subjected to forces of more than 100,000 pounds.

Liner packing and gland packing may be exposed to pressures exceeding 2000 psi, and valves and seats are required to stand violent impact every time they close.

Liners, also, are subject to "rocking," which aggravates both piston and liner packing wear unless all critical liner dimensions are held within API specifications.

These forces may be multiplied by shock loading at times, and they are completely reversed at least once every second. When you remember that mud may contain abrasive sand to cut metal parts, corrosive chemicals to pit them, and oil to attack rubber, it seems obvious that only the best pump parts stand a chance.

These Mission Pump Parts are in direct working contact with the drilling fluid, so it is easy to see that they are vital to correct pump operation. When you remember that they work together for trouble-free service, it makes sense to specify *all* Mission Pump Parts—exclusively—in all your pumps. Your pumps will perform better, require fewer repairs and cost less to maintain when you do. The famous Mission Guarantee assures you of this service.

For over thirty years - quality built in to last MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO. P. O. BOX 4209, HOUSTON, TEXAS • CABLE ADDRESS "MISSCO" • EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK
IN THE UNITED KINGDOM: **MISSION MANUFACTURING CO., LTD.**, 1 HANOVER SQUARE, LONDON W. 1 ENGLAND • CABLE ADDRESS "MISSOMAN"

J. T. Gailus

L. D. Murphy

district manager of tubular sales.

Leslie D. Murphy, former assistant manager of oil - country - tubular sales, is now manager of the tubular administration department. He has been a clerk, trainee, sales representative, division tubular representative, division oil-country-tubular salesman, and a field salesman.

Otis Engineering Corp. appoints

... Kenneth W. Robbins as northern regional manager, and J. M. Prejean as regional manager for Texas Gulf Coast operations. Robbins will also retain his duties as director of export sales and service, while Prejean will remain as regional manager for Otis' Canadian operations, Otis Pressure Control, Inc.

Robbins has been director of Otis' export sales and service department since 1956. He joined the company in

K. W. Robbins

J. M. Prejean

1946 and has held various positions in Houston and Dallas. Prejean will locate in Otis' Dallas home offices. He joined the company in 1953 and has served in various posts in southern Louisiana and Texas.

Lightnin Mixers, Ltd. is formed

... in Poynton, Cheshire, England by Stockdale Engineering Co. in England, and Mixing Equipment Co., Inc., Rochester, N. Y. The new firm will manufacture and distribute the complete line of Lightnin industrial mixers in the European market.

B. F. (Fritz) Krause joins

... McMurry Oil Tool Specialties, Inc., of Houston, as a special representative. He was formerly with Garrett Oil Tools as district manager and foreign representative. Krause has been in gas-lift-equipment engineering and sales the past 23 years.

Robert A. Frazer added to staff

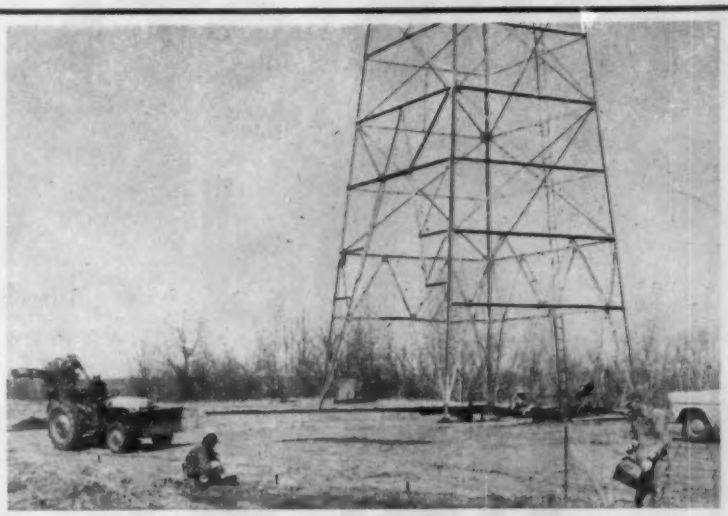
... of Industrial Fabricating Co., Tulsa manufacturer of heat-transfer equipment. As a sales engineer in Tulsa, he will assist in all phases of new product development and engineering in addition to coordinating requirements and company sales.

Frazer has 7 years previous experience in heat-exchange-equipment design and sales in the Mid-Continent and eastern U. S. and Canadian areas. Prior to that he served 3 years as a project engineer with Panhandle Eastern Pipeline Co., Kansas City.

A. M. Lowrey is promoted

... to assistant industrial sales manager of Thermold Division, H. K. Porter Co., Inc. Formerly eastern regional sales manager, he now will be responsible for marketing and sales of industrial rubber products.

Lowrey joined Quaker Rubber Co. in 1941 prior to its incorporation into H. K. Porter. He was promoted to Philadelphia district manager in 1950 and became eastern regional sales manager last year.



"CONSTANT CURRENT" RECTIFIERS STOP WELL CASING CORROSION

New "constant current" rectifiers were used to stop casing corrosion on 29 wells in West Texas recently. The wells are owned by a major oil company and are in Borden County.

Several casing leaks had already occurred in the field. The operator felt that protection was necessary.

CSI engineers installed rectifiers to provide the electrical current which is projected onto the casing to stop external corrosion. CSI furnished the rectifiers and all the other necessary materials, labor and installation equipment—augers, ditchers, etc. Cost was only about $300 to $350 per well.

The rectifiers used are of a recently developed kind that, for all practical purposes, deliver constant current despite heavy rains or extended dry periods. They compensate automatically for changes in current resistance caused by variations in the moisture content of the soil.

CSI expert and experienced engineers are your key to the best in cathodic protection for wells, transmission and distribution pipe lines, tanks, etc. Call or write today for engineering and installation services, and for quality supplies for both magnesium anode and rectifier installations. Prices are competitive.

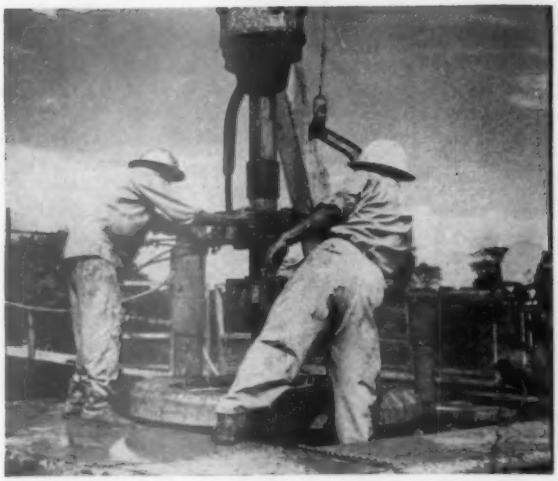
CSI

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795

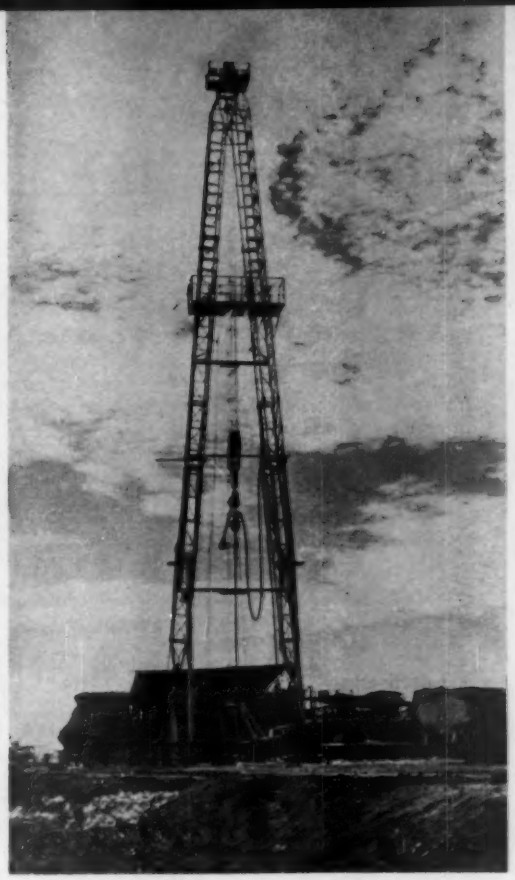
CORROSION SERVICES INCORPORATED
General Office, Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
Tel. Circle 5-1351

MERRY CHRISTMAS and HAPPY NEW YEAR

Smith TOOL CO.



MODERN EQUIPMENT, such as this National 55 operating in the Colomo field, is one reason why the Mexican oil industry is surging ahead. Another good reason is that the drilling crews are well trained and the contractors have more incentive than ever to boost drilling efficiency.



Drilling flourishes down Mexico way

A RISE in the number of private drilling contractors working for Petroleos Mexicanos, the national petroleum company, indicates that business down south is booming. During 1960, two more contracting firms joined the beelike activity.

The program is no slouch. With a goal of drilling 600 wells in 1960, the Mexicans will do just that. By midyear, 318 wells were completed. Of these 260 were development wells and 58 were wildcats. The field wells had 226 oil producers and 34 tests were abandoned as dry. Out of the total first-half effort of 318 starts, 236 produced and 82 were abandoned.

The policy of encouraging contractors to work for Pemex is the result of efforts of Gutierrez Roldan, Pemex general manager. In June there were 14 contractors working and still others were actively preparing to offer their services. At present two more have swelled to 16 the total number of drilling firms under contract to Pemex.

In September there were 148 active drilling rigs in Mexico. Now there are 152 units working. Of the 148 rigs, 109 were engaged in development programs and 39 rigs were devoted to exploration.

Total footage drilled during the first half of the year was 2,228,788 ft. The lion's share of 1,795,354 ft. was done in development while 433,434 ft. represented exploratory drilling. It is expected that exploitation during the second half will add up to an additional 1,864,400 ft. and exploration effort will amount to 440,900 ft. The total yearly footage figures of 4,534,088 will exceed 1959 footage (3,102,599 ft.) by more than 46%.

Most activity occurred in the Isthmus district where 110 wells were drilled. The Poza Rica fell to second place with 66 wells.

Contractors working for Pemex include: Cia. Perforadora Cerro Azul, S.A.; Servicios Petroleros "Eisa"; Permesa, S.A.; Perforadora Reynosa, S.A.C.V.; Perforadora Mexico, S.A.; Perforadora Latina, S.A.; Perforadora Central, S.A.; Perforadora del Golfo, S.A.; Pauley Pan American Petroleum Co.; Isthmus Development Co.; Cia. Independiente de Mexico Pan Americana (CIMA); Cia. Perforadora del Tropico; Perforadores Mexicanos de Petroleo, S.A.; Sharmex, S.A.; Cia. Perforadora del Sur; and Cia. Constructora "Otila".

One area, for example, is the Mexican tidelands—there Pauley Petroleum, Inc., is developing the Santa Ana field which was discovered in June 1959. This field lies in the Bay of Campeche, State of Tabasco.

Of the nine tests drilled there, two on land and seven offshore, there were four producers from seven zones. Two of the tests were dry and three were suspended because of storm damage.

One of the oil wells was a triple completion. With 21 potential individual pays, 10 of these have been positively tested in a single well. Development is still in its early stages and less than 1,500 acres have been drilled on the geophysically established structure. Considering the aspects, Mexico will continue to be a busy drilling region.

WITH DOWELL ENGINEERED ACIDIZING . . .

OPERATOR MAKES WELL BETTER THAN NEW

Engineered acidizing by Dowell is helping operators improve wells in many ways.

Dowell engineers use the "Acid Guide*" to design treatments for better results, lower costs, or both. Also, more and more, Dowell-developed services such as Abrasijet* (abrasive jetting service) and Rockshock* (implosive formation-treating service) are being used to pave the way for more effective acid treatments. In some instances, their use has resulted in successful treatments under conditions that were considered impossible to overcome.

Here are four recent treatments that illustrate how Dowell engineers use acid to help operators get good wells. The first is a case where engineered acidizing actually made a well better than new.

PRODUCTION INCREASED 2½ TIMES AND GAS/OIL RATIO GREATLY IMPROVED

Production from a Pecos County, West Texas well had declined from 250 to 180 bopd. Original gas/oil ratio was 1077 but had increased to 1560. Then an acid treatment, engineered with the aid of the "Acid Guide," increased production to 460 bopd. The treatment also reduced the gas/oil ratio from 1560 to 770.

The original completion was made in June, 1954. Perforations were into the Silurian (Montoyo) pay from 5118 to 5129 feet.

The engineered acid treatment recommended by Dowell used 5000 gallons of acid with a Dowell demulsifying agent added. Injection rate was five bpm at 2200 psi.

Despite the fact that the well is more than five years old, production is now considerably better than it was when the well was new.

WATER SHUT OFF--OIL PRODUCTION RESTORED WITH ABRASIJET AND MUD ACID

In Jones County, North Texas, an old well had gone to 100 per cent water. The well was completed open hole in the Palo Pinto sand between 3100 and 3260 feet. A Dowell water locator showed water entry in the zone below 3230 feet, so this zone was squeezed off with cement.

Then, Abrasijet was used to enlarge the hole and clean the formation at the most productive levels. Next, the well was acidized with 250 gallons of Mud Acid.

After clean-up, production was 56 bopd with **no water.** The operator saved a well that might otherwise have been abandoned.

KENTUCKY OPERATOR GETS 85 BOPD WELL IN AN AREA OF 15 BOPD PRODUCERS

A Dowell acid treatment resulted in a 30-day test of 85 bopd in an area where most wells drop to 15 bopd in the same period.

The well was in Muhlenburg County. Completion was through perforations into the O'Hara formation.

The Dowell treatment consisted of 1500 gallons acid with demulsifying and silicate control agents added. The operator credited these Dowell addition agents with the good results obtained.

DOWELL CUTS THROUGH TWO-FOOT MAGNESIUM BRIDGE PLUG IN SIX MINUTES

Dowell was called to acidize out a 9⅝" magnesium bridge plug that had set prematurely 90 feet below surface. The operator was afraid to drill because he could not get enough weight on the bit to balance the 2000 psi pressure below the plug.

Dowell engineers suggested the use of Abrasijet with acid. A special tool with two downward-pointing jets was run on 3½"-drill pipe and set about one inch above the plug. The pipe was held down with chains.

1000 gallons Dowell acid, carrying one pound sand per gallon, was pumped through the tool at 2500 psi. After six minutes, gas began to blow out the annulus, allowing pressure to equalize above and below the plug. The operator then went in with a bit and knocked the plug to bottom without difficulty.

Here is another example showing how Dowell uses acid **and engineering** to solve difficult problems and reduce costs. The plug was cut through in six minutes as compared to a normal drilling time of at least four hours.

Modern, **engineered** acid treatments as offered by Dowell can help producers increase their profits more than ever before. Call your Dowell representative for prompt service or detailed information. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma. *Dowell Trademark

Services for the oil industry

DOWELL

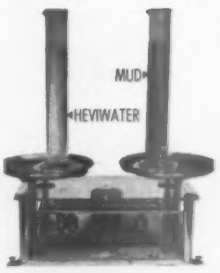
DIVISION OF THE DOW CHEMICAL COMPANY

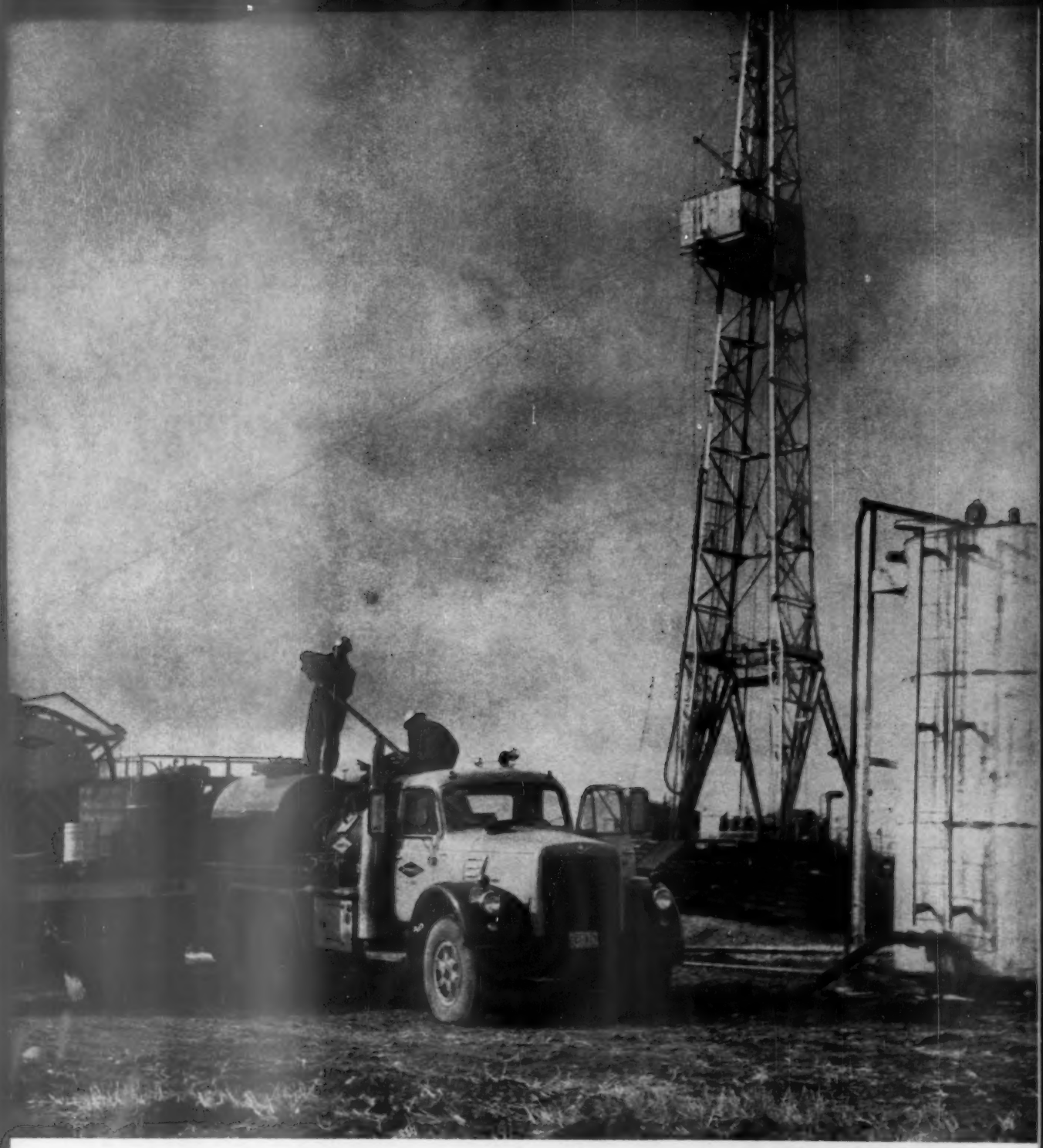
MORE IDEAS FROM DOWELL

TO HELP YOU MAKE MORE PROFIT

HEVIWATER*

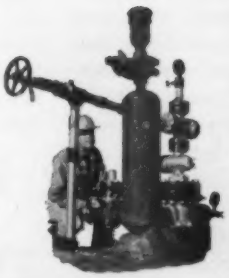
This new well completion fluid comes ready-mixed in a variety of weights. It is designed to be left, instead of mud, in the annulus above packers; also used as a protective fluid during perforating. Packer sticking and formation damage are avoided because it contains no undissolved solids. Presently stocked at Berwick, La.; can be made available at all Dowell stations.





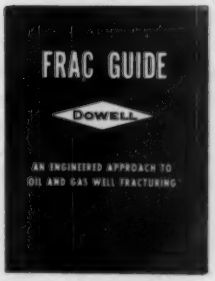
PARAFFIN INHIBITOR

This new Dowell material operates on an entirely different principle. The chemicals used do not dissolve paraffin, but are actually designed to prevent its deposition. Small amounts of the inhibitor are injected into the well periodically in the same manner as corrosion inhibitors. Careful preparation of the well is required before the treatment begins.



"FRAC GUIDE"

This Dowell collection of charts and formulas is arranged to aid in the more effective engineering of fracturing treatments. With the "Frac Guide," Dowell engineers can help you select the proper type and volume of fracturing fluids, sand sizes and quantities, injection rates and treating procedures — to give optimum results at the lowest possible cost.



Macks are the muscles of the oil fields. Here one of Bill Hodges' B-61 Model Macks places heavy machinery at drill site. Rutted, muddy footing is taken in stride because **Mack oil field trucks are built for oil field work.**

MACK for over 7 straight years NO.1 by far in sales of diesel trucks

Oil field trucker Bill Hodges says

"We use the best equipment we can buy"

"It doesn't pay to fool around with 'bargain' equipment in the oil fields," says Bill Hodges, head man at the Oklahoma City trucking company that bears his name. "Hundreds of rig moves have taught us the value of quality equipment. From trucks on down, every piece of equipment we use is one grade – the best."

Bill Hodges Truck Co. operates dozens of Macks . . . has units to handle loads up to 160,000 lbs. Macks have the capacity, the power, the rugged strength and flexibility to deliver rigs, equipment and machinery where they're wanted, when they're wanted. Mack-built Thermodyne® engines – gasoline or diesel – are unexcelled for long life, dependability and fuel economy. Mack-built transmissions are available up to 20 speeds, and are built to accommodate power takeoff units. On 6-wheel units, Mack's Balanced Bogie with Power Divider allows Mack trucks to move the heaviest loads over the roughest oil-field terrain by automatically applying controlled torque to the axle with greater traction.

In oil field work where more is demanded of a truck, you'll get more out of a Mack. Your Mack branch or distributor will be glad to show you why. Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario. 7714

MACK
FIRST NAME FOR
TRUCKS

New X-ray computer "fingerprints" rock samples

It expands ability to process data from cores and extract more information

BY FRANK J. GARDNER

GULF OIL CORP. has gone into the detective business. Its first specialty is fingerprinting; other aspects of the cops-'n'-robbers game will develop later.

But Peter Gunn, Michael Shayne, and other TV sleuths need have no fear of this new competition from a big oil company. Gulf is after rocks . . . the minerals in those rocks, that is.

An automated analyst . . . Geological detectives at the Gulf Research labs have perfected an electronic tool that makes Sherlock Holmes' magnifier as obsolete as unsliced bread. It's a new X-ray and computer procedure to "fingerprint" rocks and cores. And it's expected to play a major role in speeding up the discovery of oil.

This new analytical equipment operates completely unattended, and according to Gulf, it "puts the finger on mineral composition of rock fragments nearly 50 times faster than previous methods."

The setup consists of an X-ray machine designed to minimize noise and emphasize precision, and an IBM 704 computer which commits to electronic memory the characteristics of 35 commonly observed minerals.

Must be fed . . . In operation, this mechanized mineralogist is expected to process as many as 150 samples or cores per day. And they'll be free from human error.

The thing must be fed, however. Data derived from so-called "standard" samples of minerals are fed into the computer; samples of rock, ground to a fine powder and put in paste form onto small glass slides, are fed into the X-ray machine.

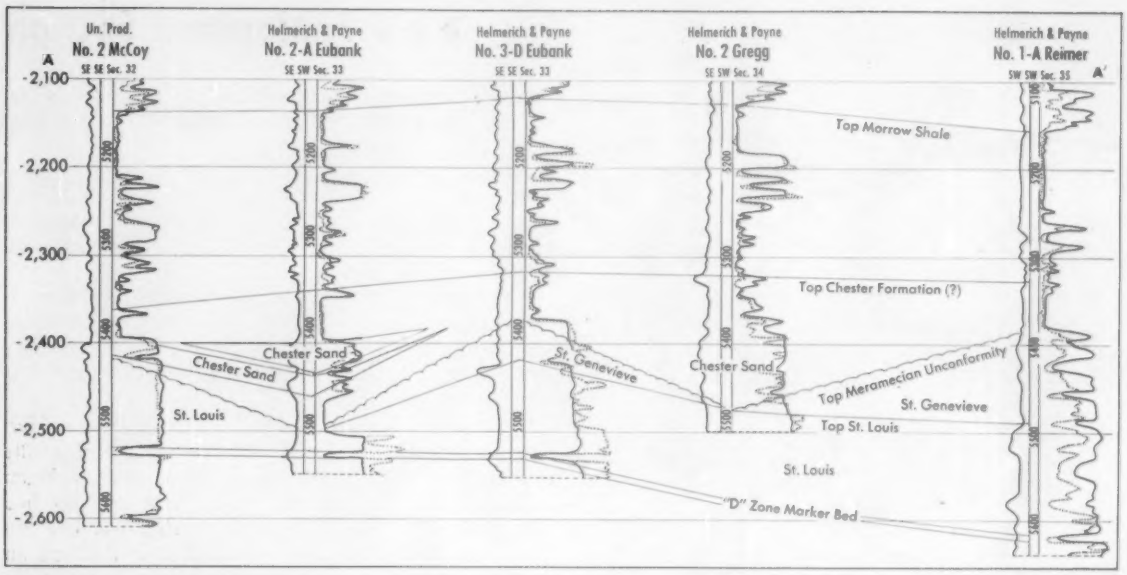
The slides are arranged side by side in a holder. Then a specially developed slide changer automatically shoots them through the X-ray beam. As the beam bombards the samples, the X-ray data are punched into cards. This analysis uses the physical phenomenon known as diffraction, wherein mineral crystals on an atomic scale make up regular arrays of similar structural layers. When a crystal is irradiated, it emits radiation in certain specific directions. And the angles at which these radiation peaks occur, along with their intensities, become the fingerprints that betray the names of the mineral constitutents present on the slides. Each has its own distinctive diffraction pattern.

Now the computer takes over and does the actual identification. In its own amazing way, this mathematical wizard absorbs and digests the punched-card data for a set of unknown samples, identifies the constituent minerals, their percentage occurrence, and correlates and prints a complete analysis of the rock samples.

And made portable . . . Gulf has high hopes for the future of this new system. It's not exactly portable in its present form, of course, but the company says that eventually a portable unit may be developed that could be taken directly to a drilling well so that core samples can be analyzed on the spot.

"The speedup in sample handling," says one Gulf scientist, "will enable us to keep up with actual operations during the drilling of an oil well, which was heretofore impossible. This automatic method will expand our ability to process data from cores and extract more meaningful information. Significantly, it relieves technically trained people from routine work and enables them to concentrate on more fundamental research. This development will help the geologist to cope with the ever-mounting quantity of samples recovered . . . , reduce the testing cost per sample, make possible complete and uniform analyses, and add immeasurably to the fund of geologic data on which the successful search for oil depends."

And so, one more time-honored function of the rockhound seems threatened by automation. No doubt, this X-ray-704 apparatus will save a vast amount of time. But it will never make up for the thousands of man-hours already spent and being spent in mineralogy labs in colleges all over the land. The millions of fingerprints on those collegiate mineral specimens and crystal block models could never be identified, . . . nor erased.



WEST-TO-EAST CROSS-SECTION depicts how the Chester sands develop. Note the apparent relationships of the Chester to the Meramecian unconformity and the effects on the Ste. Genevieve.

Eubank may be next Kansas oil and gas-producing giant

BY FRANK O. BENNETT
Helmerich & Payne, Inc., Tulsa

IT HAS OFTEN BEEN SAID that much of the old-time glamour is gone from present-day oil business, blunted by scientific advancement and buried beneath the cold, analytical application of precise exploration methods. Yet, occasionally an oil field is found to refute the statement and provide a pulse-quickening background of luck, happenstance, and sound geology.

Such is the Eubank pool area in 28s-34w and 29s-34w, Haskell County, Kansas, where a peek behind the scenes reveals some interesting facets to the still-fascinating search for oil.

Eubank pool nestles in the heart of the huge Hugoton gas field, a bare 7 miles south of its more publicized cousin, Pleasant Prairie field, which produces from oolitic zones in the top 80 ft. of the St. Louis member of the Mississippian at a depth of approximately 5,000 ft. Virtually all of the 4,000 or so square miles of leases in the Hugoton field are held by shallow gas production, from dolomitic limestones of the Chase group (Permian) at depths of 2,300 to 2,750 ft. The first gas well was completed in 1922 at Defenders Petroleum and Traders Oil & Gas 1 Boles, Section 3-33s-34w, 3 miles west of Liberal in Seward County.

Exploration of the formations below the shallow gas pay zones was, quite logically, slow in coming and it was not until the 1950's that any real effort was made by the drill to uncover the secrets of the Pennsylvanian and Mississippian sediments in the interior Hugoton. It remained for the discovery of Pleasant Prairie pool in 1954 to focus attention on the Mississippian rocks in particular, establish the existence of excellent reserves, and trigger an exploratory campaign in which the farmout and "package" drilling program has played a major role.

In 1957, opportunity knocked once more for Helmerich & Payne, Inc., (White Eagle Oil Co.), the discoverer of Pleasant Prairie, Northwest Pleasant Prairie, and Southside pools. An incredible bit of luck provided the clue to 1,680 acres of unleased (not to remain unleased for long) deep mineral rights under gas-held acreage, which is akin to finding gold in a dinosaur's tooth.

Only a few landowners in Hugoton were farsighted enough to horizontally sever the deep rights, usually designated as lying below approximately 3,100 ft. from the shallow gas rights and it is a rare day indeed when any open deep rights are brought to the light of leaseable day.

The Eubank leases were taken for a term of 3 years, in separate 160-acre tracts, and the shortness of the term precipitated an early decision to drill the prospect. Supporting the drilling recommendation were (1) a strong, old-fashioned geological hunch and (2) a Permian structure with 49 ft. of mappable west dip on the Winfield lime.

In the negative was the fact that the Pennsylvanian beds, particularly from the base of the Topeka downward, thicken to the south of Pleasant Prairie field and the Meramecian rocks (Mississippian) were expected to be several hundred feet lower structurally at Eubank, with a Chester cover 50 to 75-ft. thick.

The presence of Chester would, in itself, serve to strongly discount the possibility of Meramec production since nowhere in the Hugoton gas field had any commercial production, or even favorable indications, been encountered in these beds when overlain by the Chester formation. The sporadic performance of the Lansing, Marmaton, and Morrow formations over a broad, general area made them secondary and unpredictable targets at best. The nays, to the technical eye, outweighed the yeas.

Necessity is the mother of even geological invention and thus the "34

Frank O. Bennett graduated from the University of Tulsa with a BS degree in geology, in 1931. He has had 24 years of experience in Kansas geology.

He worked with Coralena Oil Co. from 1939 to 1948. For 5 years, he was a geological consultant in Wichita, Kans., from 1948 to 1953, and he was 2 years as assistant division geologist for Midstates Oil Corp. in Tulsa, from 1953 to 1955. In August 1955, he joined Helmerich & Payne, Inc. of Tulsa, working extensively on Kansas geological problems. During the interim, Helmerich & Payne discovered several significant pools which include Pleasant Prairie, Eubank, and Eubank Extension.

This author declares:

"This is no piddling, run-of-the-mill, garden-variety Kansas pool, to be lightly regarded by gusher-surfeited operators in neighboring Mid-Continent states."

West Bar" was spawned from a scanty hodgepodge of electrical logs in the general area to belatedly provide an additional geological prop. In virtually all tests drilled in Range 34w, from the Satanta pool in 30s-34w to the Oklahoma State line 30 miles south, a basal Chester sand was developed just above the contact with the St. Genevieve lime. This sand, although not heretofore found commercially productive, ranged up to 65 ft. in thickness and constituted a potential reservoir. Where tested, it had yielded small amounts of water, oil, or gas, and was usually characterized by low permeability and porosity. Outside of Range 34w, it was identifiable in only one dry hole in Range 35w and as a thin, poorly developed section in a single test in Range 33w. The 34 West Bar was to prove itself a worthy companion to other of the country's illustrious stratigraphic traps in February 1959, with the drilling of Helmerich & Payne 1 Eubank, NW NW NW 28-28s-34w, Haskell County, Kansas.

In mid-February the 1 Eubank drilled and cored 20 ft. of well-saturated, porous sand at 5,424-44 ft., identified as Chester and described as fine to medium-grained, subrounded, clean, well-sorted and friable. A drill-stem test at 5,377-5,483 ft., open 70 minutes, surfaced gas in 31 minutes for a gage of 2,060 M.c.f.d., with recovery of 1,005 ft. of 35.7° oil and 140 ft. of gas and oil-cut mud Final flow pressure was 749 lb. and final bottom-hole pressure was 1,521 lb.

The top of the Chester was placed at the top of the sand or 5,424 ft., the top of the Meramec at 5,452 ft. and drilling carried to total depth of 5,692 ft. in the St. Louis formation. With 5½-in. casing set at 5,500 ft., pipe was perforated at 5,439-45 ft. opposite the Chester sand and, after acid treatment of 500 gal., the well flowed 16 bbl. of oil per hour, no water, on 32/64-in. choke. The 1 Eubank was completed April 12, 1958, for a flowing potential of 506 bbl. of oil per day to open the Eubank pool and establish the **first** Chester sand production in western Kansas. Gas-oil ratio was 1,467:1.

Other discoveries, which combine to form the Eubank pool area, soon dotted the scene:

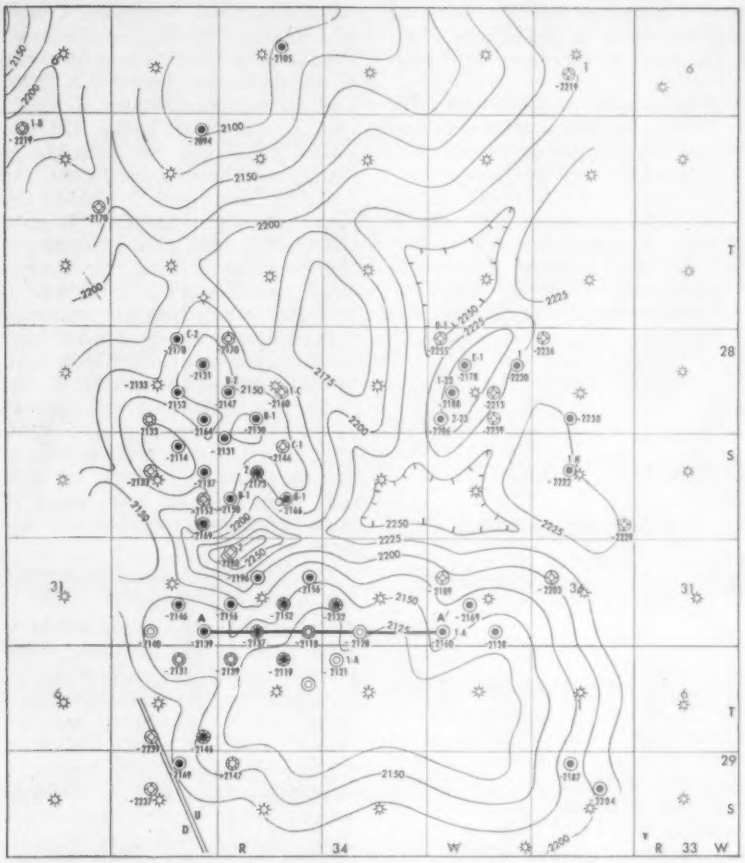
Pool	Discovery Date	Discovery Well	Location
Eubank Extension	Aug. 1959	Helmerich & Payne 1 Eubank "A"	C NW-SW 33-28s-34w
East Eubank	Sept. 1959	W. C. McBride 1 Eubank	C SE NE 23-28s-34w
Southeast Eubank	Aug. 1959	W. J. Coppinger 1 Reimer	C NE SW 35-28s-34w
South Eubank	Oct. 1959	W. J. Coppinger 1 Collingwood	C NW NE 8-29s-34w
Koenig	Jan. 1959	W. J. Coppinger 1 Koenig	C NE NW 12-29s-34w

It is anticipated that future development will link all but the East Eubank pool of these close-in areas into a common reservoir, producing from a structure approximately 5 miles wide and 5 to 10 miles long. Possible inclusions are the recent Chester sand and Morrow wildcat successes, drilled by United Producing Co., a few miles to the south in 21-29s-34w and 4-30s-34w.

Eubank is multipay field. Eubank pool area has proved to be a multipay field with 7 formations currently productive of oil or gas: Toronto, Lansing-Kansas City, Marmaton, Cherokee, Morrow, Chester, and Meramec. The Toronto, a latecomer to the ranks of the producing, flowed 3.1 M.M. c.f.d. through perforations at 4,032-8-ft. in the Cities Service Oil Co. 1 Hall "U," C WL NE 5-29s-34w, a triple completion in August 1960. The 1 Hall "U" also gaged 11.1 M.M.c.f.d. from the Lower Kansas City "B" zone and 15 M.M.c.f.d. plus 5 bbl. oil per hour from the Chester, for a combined potential of 29.2 M.M.c.f.d. The only other Toronto production in the Hugoton area is obtained from the three gas wells in the Holt field, 21 miles south in Sections 21, 27 and 28-32s-34w, where one well received an open-flow potential of 41.5 M.M c.f.d. The Toronto limestone beds in Eubank, 45 to 55 ft. thick, are typically white to light gray, dense to finely crystalline, fossiliferous, and cherty.

The Lansing-Kansas City section, approximately 510 to 525 ft. thick, is composed of gray, cream and buff, dense to finely crystalline, and finely granular limestones, interbedded with dark gray to black or varicolored shale. Individual limestone beds are cherty, fossiliferous, shaly, dolomitic, oolitic, and oolicastic. No successful attempt has been made to subdivide the section into its component formations, either by lithology or electrical logs. The top of the section is called approximately 100 ft. below the Heebner shale as compared with an interval of about 40 ft. at Pleasant Prairie. The variation is either due to a thickening of the Toronto lime or, as is more probable, to a simple miscorrelation between the two pools.

Five separate porous zones in the Lansing-Kansas City are productive of oil or gas in the Eubank pool area, three of which are found in the first 100 ft. of the formation and are here referred to as zones 1, 2, and 3. Gas volumes ranging up to 4.5 M.M.c.f.d. have been obtained in several wells in the South Eubank area from a porous, finely crystalline lime (zone 1) in the top 35 ft. of the Lansing. Porosity is approximately 15% and the net pay thickness, 15 to 30 ft. Graham-Michaelis 2-23 Eubank, C SW SW 23-28s-34w, in the East Eubank pool, was completed for 19 bbl. oil per hour from zone 2 at 53 to 65 ft. below the top of the formation. The discovery



STRUCTURE on top of the Pennsylvanian-Morrow shale indicates that where the Morrow top is high that possibility of good sand development may occur below it. The gas wells near the center of each section on 640-acre spacing are producing from shallow Permian-Chase group sands in the Hugoton gas field.

well in the Southeast Eubank pool on a Helmerich & Payne farmout, W. J. Coppinger 1 Reimer, C NE SW 35-28s-34w, received a potential of 121 bbl. oil per day after swabbing 15 to 20 bbl. oil per hour, no water, from zone 3 at 4,168-82 ft. The latter is some 20 ft. lower in the section than the producing zone in the 2-23 Eubank.

Two producing zones occur in the lower 95 ft. of the Lansing-Kansas City and have been designated, in a spacing application, as the lower Kansas City "A" and "B" zones. Two oil wells have been completed in the upper or A zone in the Eubank pool, one of which flowed 25 bbl. oil per hour, is dually completed with the Cherokee. In the Eubank Extension pool, the zone tested 8 M.M c.f.d. with 4 bbl. oil per hour in the United Producing 2 Gregg, C NW NE 4-29s-34w. The B zone, often shaly with poor porosity, is producing in a single well in the Eubank pool, Helmerich & Payne 2 Eubank, which gaged 2.2 M.M.c.f.d. in a dual completion with the Chester zone. The zone potentialed 11.1 M.M.c.f.d. in the Cities Service 1 Hall "U," 5-29s-34w (Eubank Extension), previously mentioned as a triple completion.

The Cherokee rocks consist of dark gray to black, carbonaceous shales and gray-buff, tan to brown, dense to finely crystalline, cherty limestones. A porous limestone bed near the base of the Cherokee was perforated at 5,024-32 ft. in the Northern Natural Gas Co. 1 Sprunger "B," C SE SW 21-28s-34w and completed for 64 bbl. oil per day to constitute the only production from the formation at the present time.

The Marmaton, 200 ft. or less in thickness, is represented by gray-buff to brown, dense to finely crystalline, cherty limestones, fossiliferous and dolomitic in part, with gray, black, and varicolored shale. The top of the formation is immediately below the lower Kansas City B zone, separated by 10 ft. or more of shale, but at least one operator places it approximately 50 ft. lower. The producing zone occurs at about 75 ft. into the formation, in a gray to tan, finely crystalline, oolitic lime which develops as much as 30 ft. of oolicastic porosity (15 to 20% by electrical logs).

With the exception of a 1.8 M.M. c.f.d. gas well in the Eubank pool and a 490-bbl. oiler in the Southeast Eubank pool, Marmaton wells are limited to the Eubank Extension area where six wells have been completed, two as single oil wells and four as dual completions. United Producing and Helmerich & Payne's 3 McCoy "A" unit, C NW SE 32-28s-34w, has provided the most spectacular performance to date with a flow of 65 to 100 bbl. oil per hour through Marmaton perforations at 4,689-4,702 ft. The results were all the more remarkable considering the operators ballooned a drill-stem test of only 75 ft. of drilling mud into a "keeper" with the aid of 1,000 gal. of acid. Generally, Marmaton production in Kansas has been disappointing reservewise but events at Eubank may write a new and brighter chapter in the history of the formation.

A number of wells updip from the 3 McCoy "A" unit have drill-stem-tested oil and several million cubic feet of gas from the Marmaton but have not been completed in the formation. Additional oil or gas wells can be expected in the south half of 34-28s-34w and in Sections 2, 3, and 4-29s-34w, where Winfield and deeper data point to a structurally high area. The highest Winfield datum in the entire Eubank area, a +413-ft. value, is found in the Permian gas well in SW SW NE 4-29s-34w, placing the apex of the Permian feature on the undrilled southwest quarter of Section 4.

The thickening of Pennsylvanian sediments southward from Pleasant Prairie is reflected by the definite increase in thickness of the Morrow, which ranges from 186 ft. on the top of the Eubank structure to 316 ft. in the dry hole in C NW SE 21-28s-34w. It averages about 210-ft. thick in producing wells as compared with 85 ft. at Pleasant Prairie.

The Morrow rocks are predominately shale-dark gray, light green and dark green to black, carbonaceous. Lenticular beds of white through tan, coarsely crystalline, fossiliferous, slightly glauconitic limestones and gray to clear, very fine to fine-grained, subrounded, glauconitic sandstones are developed throughout the section below the top 50 ft. of shale. Development of porosity in relatively shale-free limes and sands has resulted in oil production in four single completions and oil or gas in four dual completions.

Chester sand is prime target. Al-

though six additional formations have been added to the producing column since the completion of the 1 Eubank discovery well, the Chester sand continues to rank as the principal objective, while leaving several pertinent questions unanswered. Geologists working the field are divided as to the actual top of the Chester formation, placing it variously (1) at the top of the sand correlative with that producing in the 1 Eubank, (2) on a limy sand identifiable in most wells approximately 30 to 60 ft. higher in the section and (3) at a point of lithological change in the section above the producing sand, as in the Helmerich & Payne 1 Eubank "A," C NW SW 33-28s-34w. In the 1 Eubank "A," a 15-ft. bed of varicolored, sandy, dominately green, bryozoan shale—unquestionably Chester in age—rests upon the upper Chester sand. Occasionally the sand is found directly below a tan to gray, glauconitic, pyritic, and oolitic limestone of Chester age.

The Chester formation wedges out within 2 miles to the north of Eubank against a structure in Sections 4, 5, 8, and 9-28s-34w, forming a structural-stratigraphic type trap for the Chester sand reservoir. As many as three separate sand lenses have been found in several wells, and there are possibly more than three in all, although the Chester sand was originally thought to be a single, massive sand body. Certain lenses, apparently correlative from well to well by electrical logs, are probably separate zones, judging by production tests and other available data. An outstanding example is the dry hole in the C SE NW 29-28s-34w, United Producing 2 Winstead, which cut 34 ft. of Chester sand at 5,419-53 ft. and ran 2 ft. higher structurally on the top of the sand than the H. & P. 1 Eubank. Tested through perforations, the lower portion of the sand yielded 13 bbl. of oil and 136 bbl. of water in 3 hours; the upper 9 ft. swabbed 2 bbl. oil and 1 bbl. water per hour. Another of the reservoir oddities is furnished by H. & P. 1 Eubank "E," C SE NW 23-28s-34w, in which three Chester sand lenses are developed with an aggregate thickness of 64 ft. The lower sand tested gas only, the middle lens flowed 5½ bbl. oil per hour with 2.2 M.M.c.f.d. and the upper sand, dually completed with the Morrow, swabbed oil and a small amount of gas.

Where nonproductive, the Chester sand may be missing entirely or ranging from a poorly developed sand zone to a very tight, low permeability sand. In producing wells the sand thickness varies from 4 ft., in the Northern Natural 2 Sprunger "B," C NW SW 21-28s-34w, to 100 ft. or more in the East Eubank pool where the Graham-Michaelis 1-23 Eubank, C N½ SW¼ 23-28s-34w, logged 112 ft. of Chester sand in five lenses separated by thin shale beds. Although the lower sands were indicated to be "wet," the pay zone is 50 ft. thick occurring as a porous, massive sand at 5,406-56 ft. The well flowed 136 bbl. of oil in 5 hours, natural, through perforations at 5,406-30 ft.

Three of Helmerick & Payne's wells in the S½ 33-28s-34w, have 45 ft. or more of sand. One of these, the discovery well of the Eubank Extension pool, 1 Eubank "A" in the C NW SW of the section, shows two sand lenses aggregating 61 ft. in thickness with 48 ft. of net porosity—all productive.

Minor production and scattered oil shows have been found in the underlying Maramecian rocks which, normally, lack the characteristic zones of porosity productive in the St. Louis formation at Pleasant Prairie. United Producing 1 Stucky, C SE NE 29-28s-34w, tested 150 bbl. of oil and 8 bbl. of water in 24 hours from a lime immediately beneath the Chester sand pay, which is either basal Chester or Meramec. The Meramec does provide some pyrotechnics of its own in the following statement — which may ruffle the placid waters of geological thinking and evoke protests from geologists who have the Mississippian stratigraphy "solved." There does not appear to be any St. Genevieve present in many of the Eubank area wells, placing an unconformity at the base of the Chester rocks, the first time that such an unconformity has been recognized in western Kansas or the Anadarko basin proper.

The carbonate rocks underlying the Chester have been frequently referred to by field geologists as Meramec or merely as Mississippian Lime. These limestones display a varied, if not bewildering, lithology and their identification as St. Louis is based upon (1) well samples, (2) cores, and (3) electrical logs. The original key was furnished by 1 Eubank, NW NW NW 28-28s-34w, which cored the base of the Chester sand and the top of the Meramec. The Meramec in the upper part of the formation, consisted of fine to coarsely crystalline lime and buff to tan, fine crystalline, fossiliferous, oolitic lime in which the oolites were round and the same color as the matrix. Joseph R. Clair (1948) states that St. Louis oolites are "almost the same color as the matrix and are perfectly spherical, whereas the St. Genevieve oolites are elliptical, rather than round, and are always darker in color than the containing matrix."

In the 1 Eubank "A", Chester sand is underlain by 6 ft. of green shale resting on limestone of definite St. Louis lithology; gray-buff, lithographic, slighty sandy with fine, medium and coarse oolites, and light, medium gray to pinkish, smooth, subtranslucent cherts. A core taken from the H. & P. 1 Eubank "G", C NW SE 28-28s-34w, shows the Chester in contact with a cream to gray, very fine crystalline, arenaceous, oolitic limestone, identified as St. Louis.

Where the St. Genevieve is truncated, there is no indication of the dark green, waxy to subwaxy, calcareous shale bed which separates the St. Genevieve and St. Louis limestones at Pleasant Prairie, but the so-called "D" zone of Pleasant Prairie, a 6-ft. bed of light gray, bentonitic shale, is readily identifiable on electrical logs and serves as an excellent marker bed for correlation purposes. The position of the D zone establishes not only that the St. Genevieve is absent in the H. & P. 2 Eubank "A," C SE SW 33-28s-34w, but that 60 ft. or more of the top of the St. Louis has been removed as well. A similar situation exists in the Shell 1 Miles, C NE SW 1-28s-34w, a dry hole drilled in August 1959, 3 miles northeast of Eubank.

Structurally, the Eubank area poses few problems. Permian anomalies supplied the basis for the drilling and discovery of all the area pools and, as at Pleasant Prairie, symmetrically reflect the deeper structures except in the East Eubank pool where the top of the Mississippian structure is 1 mile east of the Permian apex. Excluding East Eubank, drilling to date has disclosed the presence of two closely related structures, separated in both the shallow and deep beds by a structurally low dry hole in the NW NW NW 33-28s-34w, which reflects the possible existence of an east-west-

"Eubank is a lusty, growing giant which, in number and variety of pay zones and per well recovery, is rapidly shaping up as one of the greatest of all Kansas oil and gas contributions."

trending, nonproductive trough along the section line between sections 28 and 33-28s-34w.

The south dome is of rather impressive proportions with the Eubank Extension pool on the northwest flank, and the Koenig pool rounding out the east flank. Development of the structurally high, relatively undrilled area in Section 34-28s-34w, and Sections 2, 3, and 4-29s-34w, should eventually merge these pools into one large field and fulfill the promise of a gas area in the Toronto, Lansing-Kansas City, Marmaton, Morrow, and Chester formations on a portion of the undrilled acreage.

An abrupt change in dip on the top of the Meramec in the United Producing 4 Collingwood, C SE NW 8-29s-34w, suggest faulting in late Mississippian or early Morrowan time on the southwest flank of the structure. The possibility of faulting is supported by seismic investigations made subsequent to the drilling of this dry hole, in which the Winfield is 19 ft. lower than the northeast diagonal producing offset and the Morrow thickens from 234 ft. in the offset to almost 400 ft., combining to place the Meramec 189 ft. low.

Reserves? This is no piddling, run-of-the-mill, garden-variety Kansas pool, to be lightly regarded by gusher-surfeited operators in neighboring Mid-Continent states. Eubank is a lusty, growing giant which, in number and variety of pay zones and per well recovery, is rapidly shaping up as one of the greatest of all Kansas oil and gas contributions. In a pool now boasting 35 producing wells on 80-acre spacing, many of them dual completions, the reserves are—for the want of a better word—plush!

Estimation of recoverable reserves for the Chester sand in particular, is complicated by lensing, variations in porosity, permeability and sand thickness plus the various graduations of oil, oil and gas, and gas within an 80-acre tract. However, recoveries of 200,000 to 300,000 bbl. of oil per well are not expected to be uncommon for wells with 20 ft. to 30 ft. of productive Chester sand. Gas reserves, based on a like amount of sand and 320-acre spacing, are estimated at upwards of 3,500 M.M.c.f. per well.

Oil reserves for individual Lansing zones are pegged at 70,000 to 90,000 bbl. per well, with similar figures applicable to the Marmaton and Morrow, and gas estimates for each of these formations are placed at 1,000 M.M.c.f. or more per well (320-acre spacing). Dual or triple completions and behind-the-casing pays add a bright hue to the per well recoveries, as field operators chuckle gleefully over day-by-day production surprises unfolding beneath the bit.

Eubank area is but a small corner of the vast Hugoton gas field, where the geologist worth his salt can call his wildcat shots with fine accuracy and a success ratio of less than 40% is for the neophyte. There are at least a half-dozen, textbook-clear structures in the vicinity that are odds-on favorites to provide more Pleasant Prairie-Eubank-type pools. One company controls over 9,000 acres of solid leases on an undrilled structure 7 miles long and 3 miles wide that ranks with the best. Only time and the drill will tell the complete story but meanwhile the spotlight will continue to focus on a magic name in Kansas oil—Eubank.

Southwest Kansas adds another Morrow discovery

Morrow Pennsylvanian gas production is reported at a Clark County wildcat in southwestern Kansas. Discovery well is Graham-Michaelis Drilling Co. 1-5 Wilson in C SE NW 5-33s-21w, about 2½ miles east of Ashland.

Flow was 4,700 M.c.f.d. from perforations in the Morrow at 5,252-55 and 5,270-76 ft. Testing continues.

Russell County. Birmingham-Bartlett Drilling Co. 1 Woydziak "B," SE NE SW 25-15s-12w, 1 mile west of Driscoll field, made 141 bbl. of 36°-gravity oil daily on state test. Production is from Arbuckle Cambro-Ordovician at 3,309-14 ft., open hole. Location is 9 miles south of Dorrence.

Haskell County. Both Lansing and Morrow Pennsylvanian production are set at a well in South Eubank field. Discovery offset is 3 Ray, a United Producing Co., Inc., well in C NW NW 21-29s-34w, the third producer in the new field. Flow was 17 M.M.c.f.d. from Lansing at 4,063-95 ft. and Morrow at 5,284-5,330 ft.

Marion County. Year-old East Hillsboro field is growing fast. Francis O. Hawn 1 Siebert, a Mississippian gas discovery in NE NE NW 17-19s-3e, started the play. After the gas discovery last year, E. K. Carey opened oil production in the Mississippian at 1 Siebert in SE NW SE 17. Then came Viola Ordovician oil at 3 Siebert in SE NE SE 17. Too much water in this well forced completion in the Mississippian, however. Two indicated extension discoveries now loom at Marvin Deckert 1 Ewert in NE SE NE 18 and Buick Drilling Co. 1 Nickel in NW NW NE 19.

Old field revived. An old field in Saline County, Hunter Douglas Mississippian pool, is being revived. Houston Petroleum Co. and Glickman Oil Co. completed a Mississippian oil extension at 1 Reese in NE NE SE 30-16s-1w last summer to open a new area ½ mile south of depleted wells. In November the 1 Ellis, a northwest diagonal offset in S½ SE NE 30, indicated oil production. The 2 Reese in SW NE SE 30 and 1 Peterson in SW SW NW 29-16s-1w are new wells to be drilled.

November Multiple Completions

	Dual	Triple
Arkansas	..	1
Kansas	1	..
Louisiana	29	5
North	2	1
South	22	1
Offshore	5	3
New Mexico	11	..
West	5	..
East	6	..
Oklahoma	21	..
Texas	73	7
District 1	6	..
District 2	9	..
District 3	18	1
District 4	9	2
East (5 & 6)	4	1
District 7-b	3	1
West (7-c & 8)	13	1
District 9	4	..
District 10	7	1
Wyoming	2	..
Total U. S.	**137**	**13**

Arizona test dry

Superior Oil Co. failed to extend production south of its Carrizo Mountain gas condensate discovery drilled last year in Apache County, Arizona.

The M 23-21 Navajo, drilled jointly with Pan American Petroleum Corp., was abandoned after being taken to a total depth of 5,991 ft.

The dry hole, in 21-41n-30e, is 1 mile south of Superior's 14-16 Navajo, which was completed in January 1959. The discovery flowed gas at a rate of 12,500 M.c.f.d. along with 100 bbl. daily of 64.8°-gravity condensate. The well was perforated at 4,090-5,032 ft., 5,035-40 ft., and 5,063-71 ft. in the upper Boundary Butte and Desert Creek formations.

Wildcat slated on block in Sacramento Valley

Rinde Oil Co., Los Angeles, plans to test a 3,000-acre block it holds in California's Sacramento Valley with a 4,000-ft. wildcat.

The operator is preparing to spud its 1 Cook in 3-17n-1w in Colusa County. The acreage is near two recent gas discoveries.

Humble Oil & Refining Co.'s 1 Angel Slough discovery is 3 miles north of the Rinde block. The Humble well was completed in June at a rate of 2,350 M.c.f.d. through a 22/64-in. choke. The flow was from 2,383-96 ft. The Rinde location is 3 miles east of Universal Consolidated Oil Co.'s 1 Rheem-Hammer, which was completed in September. The Universal Consolidated well flowed at a rate of 3,087 M.c.f.d. through a ⅜-in. choke from 2,315-28 ft.

Oil discovery made in southern California

An oil discovery has been made in the extreme eastern portion of southern California's Riverside County.

Alpoil Co. reports its Government T.M.P.-C. pumped 51 bbl. of 25°-gravity crude during a 7-hour test. The flow was from perforations at 2,758-3,125 ft. The wildcat was drilled to a total depth of 3,569 ft. It is located at 17-3s-17w in the Prado Dam area of Riverside County.

The discovery is a mile east of Atlantic Oil Co.'s 1 Aros, a producer, and 1½ miles southeast of Chino-Mahala field, which is being developed by Mobil Oil Co. This production is on the western edge of the producing trend which covers much of the northern part of Orange County. The Olpoil well is only about 5 miles from Orange County.

Tidelands test spudded in California

Another wildcat is drilling in the tidelands off Santa Barbara County, California.

Standard Oil Co. of California is drilling below 1,200 ft. on the 2 State 2198.2 in the Orella area off Santa Barbara County. The test is being drilled from a floating drill ship about 2,800 ft. offshore.

The wildcat is on Parcel B, one of two state-owned blocks leased by Standard of California and Humble Oil & Refining Co. in 1958. The companies reportedly have established production on the other block, Parcel C, which is 4 miles to the west, but have failed in their efforts to score on Parcel B.

The No. 2 well is about ½ mile northeast of the Refugio State 1, which was abandoned at a total depth of 6,673 ft. in February 1959.

Michigan offset hits

The Burdell prospect in Osceola County again is alive with a 1,320-ft.-north offset to the year-old discovery flowing 10 to 13 bbl. per hour from Dundee section at 3,671 ft. Robert Bond 1 Van Antwerp, SE NE SE 19-20n-10w, drilled dolomite pay from 3,668-71 ft. Well flowed 35 bbl. day by heads natural and increased to 230 bbl. day with 500 gal. acid treatment. Bond staked a north offset.

The area gained attention a year ago by Bond's discovery but the play went slack after west, south, and east offsets proved dry.

Natural-gas production jumps in Ontario

OFFICIAL Department of Energy figures show that Ontario natural-gas production increased to 16,389 M.M.c.f. in 1959 from 16,148 M.M.c.f. in 1958, a gain of 4.28%.

Most of the increase was due to larger outputs from Dawn 156, Colinville-Kimball, and West Belcher in Lambton County, and Tilbury-Lake Erie in Kent County. Field price of the gas ranged from 35 cents to 50 cents per M.c.f. with an average wellhead cost of about 36.36 cents per M.c.f.d. Total field value is estimated at $6,123,000.

Oil output. Oil production in Ontario in 1959 showed a gain of 28.7% over 1958. Rodney and Corunna fields were the two big sources, accounting for 28.6% and 20.9%, respectively. Total value f.o.b. the Sarnia refinery was $3,194,340, a new high. Wellhead value was about $2,900,000. Price of crude in 1959, f.o.b. Sarnia, was $3.37 per bbl. up to March 23, $3.15 thereafter.

There were 68 producing companies, 39 individuals and estates, 22 companies, and 7 syndicates and partnerships.

Colchester. This oil field in Essex County was of major importance to Ontario's oil output. The discovery not only added reserves to Ontario's coffers, but began new exploratory interest in the Ordovician Trenton potential.

There was continued increase of production from Silurian pools in Lambton County aided by two discoveries in Moore Township. One was a small pool near Sarnia. The other was a major extension to Seckerton field. There were 19 new oil wells during the year.

Completions. Of all completions 38% were exploratory in Ontario in 1959. These wildcats lay in that part of peninsular Ontario to the southwest of a line drawn from Kincardine on Lake Huron to Toronto. Twenty-five of the 118 wells were drilled in Lake Erie. Only eight of these wildcats were producers. Five of the eight were Silurian producers, three were Ordovician strikes.

Three of the five Silurian successes extended existing as fields; one in Middleton Township, Norfolk County, and one in Howard Township, Kent County. The third extended the offshore boundary of Tilbury field in Kent County. The other two Silurian strikes were in Moore Township, Lambton County. This is one of the most prolific counties in Ontario. Both found oil in the Guelph; one was a new field near the northern line of the township, the other extended the northwest side of Seckerton field, establishing it as a major source of Ontario oil. The three successful Ordovician tests were in widely separated areas on the province. One in Trafalgar Township, Halton County, found gas production in the Black River. Another discovery was made in Aldborough Township, Elgin County, south of Rodney. This one found gas in the Trempealeau member of the Cambrian, at a pressure higher than ever recorded in Ontario. The third Ordovician discovery, one of the most important in recent years for Ontario, was in the Trenton at South Colchester Township, Essex County, near the Lake Erie shore. Development drilling

has been good and the field is emerging into major proportions.

Development drilling. Field-drilling success ratio stood at 67.3%. A major part of this, 82.5%, had Silurian objectives. This drilling took place in Lambton Middlesex, the six counties fronting on Lake Erie, and in the lake itself. The 50 field-well completions in Lake Erie resulted in 32 gas producers with a total open flow of 28.7 M.M.c.f.d., 1 oil well at Colchester, and 17 failures. The more important lake gas wells were located off Port Maitland and Selkirk in Haldimand County; in Long Point Bay, Norfolk County, and in the offshore portions of the Tilbury and D'Clute fields, Kent County. Three good wells were completed near Port Maitland, with a combined open-flow of more than 10 M.M.c.f.d.

Good oil wells were completed in Colchester field, Essex County, and in the various pools of Moore Township, Lambton County.

From Eastern Gas and Oil Report, Port Credit, Ontario.

Prolific gas strike reported in Canada

IN CANADA Hunt Oil Co. has come up with one of western Canada's largest gas-flow rates during drill-stem test operations. While flows of up to 27 M.M.c.f.d. were recovered at the Berland River-D3 discovery hole and multimillion flow tests have been obtained from others, the Hunt well should take a back seat to none of them. This week the company drilled into the Viking sand 55 miles due west of Red Deer in the Ferrier district and tested only 10 ft. of an apparent 27-ft. sand for a maximum flow estimated to be 36 M.M.c.f.d.

This well, Hunt 6-28-39-8 Ferrier, on LSD 6, 28-39-8w5, is only 1 mile north of Viking sand oil completions in Ferrier field, drilled some time ago by Southern Production Co. (now Sinclair Canada Oil Co.) and Pacific Petroleums, Ltd. Rocky Mountain House Cardium oil field lies 10 miles southwest of the new strike and Hunt's first test in the area—a 13,506-ft. dry hole—is 3 miles due south.

Viking. The Viking sand on this well came in around the 8,370-ft. level and the drill-stem test was a 20-ft. evaluation—10 ft. above the formation and 10 ft. immediately below. In addition to the 36 M.M.c.f.d., oil sprayed to surface during the test and a pipe recovery of 905 ft. of oil was recovered from the drill-stem.

Hunt is drilling this well on lands included in Drilling Reservation No. 542 which the firm purchased from the Alberta Government on May 21, 1959.

New Kansas field gains confirmation

The second well and confirmation discovery for Holman Mississippian field in Sumner County, southern Kansas, is a success. Donald C. Slawson 1 Dundore in NW NW SE 26-33s-2e, 8 miles south of Oxford, flowed 400 bbl. of 40°-gravity oil per day from perforations at 3,302-8 ft. to confirm the new field.

The discovery well at Holman was Slawson 1 Holman in SW SW NE 26-33s-2e. That September discovery made 170 bbl. of oil daily from Mississippian perforations at 3,306-12 ft.

Morton County. In Southwest Kansas, Pan American Petroleum Corp. opened Morrow Pennsylvanian gas production at two wells in northeastern Morton County.

The 1 Winter Gas unit "C," C SW NE 27-31s-40w, east extension to Kinsler field, made 5 M.M.c.f.d. from Morrow at 5,605-7 ft. The 1 Fidelity Savings Gas unit "B," C SW NE 13-32s-40w, south extension to Southeast Kinsler field, made 15 M.M.c.f.d. from perforations at 5,780-82 and 5,706-98 ft. during a 12-hour test.

Salina basin. Solar Oil Co. completed 1 Dieter in C E½ SW NE 7-15s-2w, 3½ miles south of Salina in Saline County at the south end of the Salina basin. The well pumped 192 bbl. of oil per day plus 50% water from open hole in the Maquoketa at 3,219-25 ft. Location is 1½ miles southwest of South Salina field.

Kansas hit extends Arbuckle to northeast

CENTRAL KANSAS has an important Arbuckle Cambro-Ordovician discovery more than 5 miles northeast of nearest such oil. The discovery well is Thunderbird Drilling Co. 1 Wellman "I," SE SE SW 33-21s-9w, ¾ mile southeast of Northeast Wisby Simpson Ordovician field.

The southern Rice County wildcat recovered 1,675 ft. of oil on a drill-stem test at 3,527-35 ft. Natural production was tapped from 5 ft. of open hole, making 110 bbl. of new oil in 10 hours. Pump has been set up for state test.

Behind the pipe the well has untapped oil in the Lansing-Kansas City-Pennsylvanian and Simpson zones. A drill-stem test at 3,074-85 ft. in the Lansing-Kansas City had 125 ft. of clean oil. A test in Simpson at 3,468-95 ft. recovered 120 ft. of gassy oil, 120 ft. of clean oil and 1,980 ft. of gas in the pipe, and 10 ft. water.

Offset. Tennessee Gas & Oil 1 Fair in NE NE NW 4-22s-9w, just across the Reno County line inside Rice County is a south offset. The Simpson had oil traces, and the Arbuckle had excellent showings. No oil was found in the Lansing-Kansas City.

A test in the Arbuckle at 3,523-46 ft. got 1,770 ft. of free oil and 60 ft. oil-cut mud. A test at 3,547-71 ft. got 3,010 ft. of oil and 180 ft. of slightly mud-cut oil, no water. A test at 3,570-91 ft. got 2,410 ft. of frothy, mud-cut oil and 580 ft. salt water. The Simpson was tested at 3,466-3,507 ft., getting 120 ft. oil-cut mud, 120 ft. of heavily oil-cut mud, and 60 ft. of very heavily oil-cut mud, with 1,300 ft. of gas in the pipe.

Northwestern Ohio drillers continue high success ratio in Ashtabula County's Bushnell field

In northeastern Ohio, particularly in Monroe Township, Ashtabula County, drilling continues at a brisk pace with good results in Bushnell pool.

Biller & Flanigan 1 C. & A. Waid, Section 3, about ½ mile from production, tops the successes this year with a natural flow of 7,139 M.c.f.d. from the Clinton sand logged at 3,174-92 ft. In Section 11, Union Carbide finaled 1 T. Waddle as a 2 M.M.c.f.d. producer after fracture. The Clinton was logged at 3,218-30 ft. and the rock was 910 psi. Felmont Oil Corp. has a producer on 1 Josephine Hagle, Section 24. It had the Clinton at 3,204-10 ft. and gaged 1,400 M.c.f.d. after fracture.

Additional activity in the pool includes two stepouts, each about 1 mile north in Conneaut Township. James Drilling Co. 1 S & M Donovan, Lot 33, gaged 2,064 M.c.f.d. after fracture with a rock of 950 psi. Gladson Drilling Co. 1 G. & H. Hintsa, Lot 49, gaged 200 M.c.f.d. after fracture. The Clinton sand was found at 3,089-3,125 ft. and 2,944-96 ft.

Ohio interest is paying off

In Ohio, a surge of interest in the Clinton formation in various areas of Hocking County this year has shown good results. The most recent area

yielding good producers after several years of limited activity is Washington Township.

Two edge wells in Union Furnace pool have been completed by A. M. Carlson in Section 27. The 1 Carrie B. Lane, tested 110 bbl. of oil with 2,210 M.c.f.d. of gas 3 days after fracture and the 1 B. F. Primmer made 100 bbl. of oil with an estimated 500 M.c.f.d. in a 24-hour test 2 weeks after fracture. The Clinton sand was logged at 2,807-41 ft. and 2,830-56 ft. respectively.

Geological survey publishes research papers for 1960

A comprehensive summary of recent geologic findings by the USGS has been published as two separate chapters of Professional Paper 400, the Department of the Interior has announced. Publication of these volumes is an experiment aimed at meeting widespread public and professional demand for important research results at the earliest possible date.

Results of the investigations reported relate to all 50 states, many foreign areas, Antarctica, and the moon. Some of the work has been done on behalf of other federal agencies.

Chapter A (138 pages, 4 illustrations), a separate volume, is a synopsis of a wide variety of geologic studies and was prepared under the direction of Vincent E. McKelvey by members of the Survey's geologic division. The Survey's geologic activities, exclusive of those directed toward the occurrence of ground water, are described in broad categories of mineral resources investigations, development of exploration and mapping techniques, geology applied to problems in engineering and public health, regional geology, geologic processes and principles, and analytical techniques. Lists of investigations in progress, and of the several hundred technical reports released during the fiscal year are included.

Chapter B (515 pages, 303 illustrations) consists of 232 individually authored papers, averaging about 1,000 words in length. Some are scientific notes announcing new discoveries; others are summaries of more comprehensive investigations. In subject matter they cover practically every field of the earth sciences.

Copies of Professional Paper 400-A and 400-B are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at $1 and $4.25 respectively. The separate chapters are not available in a combined volume. Copies may also be purchased over-the-counter but not by mail at the following Survey offices: 503 Cordova Building, Anchorage, Alaska; 468 New Custom House, Denver; 602 Thomas Building, Dallas; 1031 Bartlett Building, Los Angeles; 232 Appraisers Building, San Francisco; 504 Federal Building, Salt Lake City; and South 157 Howard Street, Spokane.

Booklet on Texas land surveying available

A valuable new booklet on Texas land surveying is available from Southwest Publishing Co., 6815 Joyce Street, Austin. Written by Guy R. Holcomb, this booklet contains all of the principal laws on Texas land surveying. This booklet will be of great interest to land departments of oil companies who regard surveying of Texas land as a major problem.

Core library needs industry support

Efforts are under way to establish a core library at the University of Oklahoma in Norman. Contributions from companies and individuals are being solicited. Publicity notices have been sent to more than 250 companies, independent operators, service companies, and consultants. No money will be spent until the university agrees that the minimum amount necessary for setting up the library has been contributed.

The university has been notified by the General Services Administration that a certain part of the former naval training base has been assigned to the school. A building which has 20,000 sq. ft. of floor space has been selected as a sample and core-library site. Future emphasis will be on cores rather than samples.

The committee appointed by the executive committee of the Oklahoma City Geological Society that initiated the library proposal feels that it is an economic and scientific waste to spend thousands of dollars cutting cores and then not retaining them for future study. Local core labs state that less than 50% of the cores which they receive for analysis are either filed by the operator or shipped to the sample cuts to be chipped and distributed with the cuttings. It is with the idea in mind of eliminating this loss of geologic data that the tentative plan was established for the core library at OU. This library would be of great use to both students and industry geologists.

Contributions should be made to the University of Oklahoma Foundation, Core Library fund, Core Storage Committee, 1200 First National Building, Oklahoma City 2.

Paleogeologic Maps now available

A new book has been released by W. H. Freeman & Co., 660 Market Street, San Francisco 4, authored by A. I. Levorsen. This new contribution to geologic literature is Paleogeologic Maps.

The acceleration in mapping surface geology, the large number of wells drilled for oil, and the widespread use of geophysical surveys have made great volumes of new stratigraphic data available in recent years. These new data may be combined in a variety of ways which permit answers to geologic problems that were insoluble even a decade or two ago. The scope of some of these problems is local, as within an oil field; of others it is regional, as the area of a country or a continent.

This book demonstrates how paleogeologic maps may be used by students and practicing geologists interrested in the history of sedimentary rock sequences. It shows how such maps are prepared and explains some of the interpretations that may be made from them. A paleogeologic map is but another tool that the geologist can use to gain a better understanding of some of the episodes in the geologic history of an area. Price of this new book is $6.

Prolific gas-condensate well reported in Texas

An unusually prolific and rich gas-condensate discovery for that part of the state has been made in a wildcat test a mile southwest of San Diego, in Duval County, Southwest Texas. It is by J. W. Gorman at his 2 Oliveiria, Jr., which is completed with an open-flow potential of 40 M.M. c.f.d. of gas, making 23 bbl. of 60°-gravity condensate per 1 M.M.c.f.d Flowing pressure through 5/32-in choke was 1,915 psi. Pay is perforated at 5,091-97 ft.

Arizona wildcat dry

Another wildcat in Arizona has been abandoned as a dry hole. Sierra Drilling Corp. has plugged its 1 Campbell at a total depth of 1,200 ft The test was drilled in 36-3n-18w in Yavapai County. Location is about 9 miles south of Ashfork and U. S. 66. Earlier in the month Superior Oil Co. abandoned the M 23-21 Navajo in 21-41n-30e of Apache County at 5,991 ft

Burst-test for cylindrical-pressure vessels fabricated from USS 9% Nickel Steel, cooled to —320°F, then pressurized to bursting. This one was quenched and tempered—not stress relieved.

Same vessel after bursting at a pressure of 2,160 psi—almost 6 times the design stress of 370 psi.

Operation Cryogenics—Success story of USS

Destruction tests on welded tanks holding liquid nitrogen prove that vessels made from quenched and tempered or double normalized and tempered 9% Nickel Steel, *without* post-fabrication stress relieving, equal—and often exceed—the performance of vessels made of the same steel, which are stress relieved after fabrication.

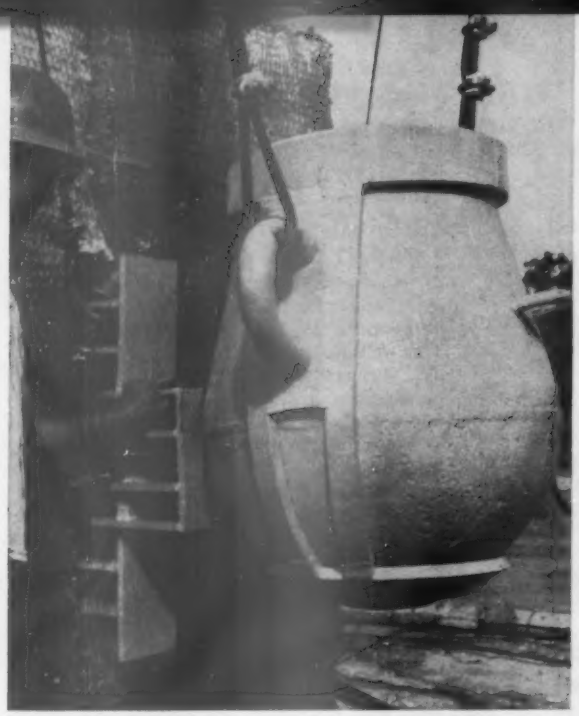
Recently, a series of impact and burst tests, known as "Operation Cryogenics," were performed on 9% Nickel Steel pressure vessels at the Fairless Works of United States Steel. The science of cryogenics, involving the development and practical utilization of materials in extremely low-temperature service, has assumed major importance in industry and in national defense. Much preliminary and advanced development work has been done cooperatively by The International Nickel Company, Inc., The Chicago Bridge & Iron Company, and United States Steel Corporation.

Objectives of "Operation Cryogenics" were to demonstrate (1) the suitability of 9% Nickel Steel, quenched and tempered or double normalized and tempered, in the as-welded condition (not stress relieved), for very low-temperature use; (2) the excellent properties of quenched and tempered 9% Nickel Steel; (3) the ductile behavior of 9% Nickel Steel in the as-welded condition during enforced failure at very low temperature; (4) the behavior of 9% Nickel Steel in the stress-relieved condition for very low-temperature use.

Test conditions: Two basic types of vessels were tested—rectangular vessels 8 feet square and 6 feet high simulating a type that might be used for shipboard transportation of liquefied gases, and cylindrical vessels 4 feet in diameter and 13 feet long with hemispherical heads such as are used for land-based storage and transportation of liquefied gases. All vessels were welded from economical 9% Nickel Steel plate $\frac{3}{8}$" thick, from the same heat of steel.

A total of nine vessels was built for the test. Five were made from 9% Nickel Steel plates and forgings in the quenched and tempered condition (QT) and four in the double normalized and tempered condition (NNT). Further, six of the vessels were tested as welded (AW), without any heat treatment after fabrication. Three were stress relieved (SR).

Impact test results. Impact testing of the three rectangular vessels, refrigerated with liquid nitrogen to –320°F, illustrated that 9% Nickel Steel vessels are capable of undergoing extensive plastic deformation even at extremely low temperatures. The vessels were repeatedly impacted both under pressure and without pressure by blows exceeding 80,000 foot-pounds. One quenched and tempered vessel did not fail, despite 7 impacts. Results clearly indicated the ability of quenched and tempered 9% Nickel Steel vessels in the as-welded condition (not stress relieved) to withstand impacts far beyond any which are likely to occur in service.



4340-pound wrecking ball used in striking rectangular vessels from varying heights.

Impact Test—Rectangular vessel of 9% Nickel Steel quenched and tempered but not stress relieved, refrigerated to —320°F. Withstood severe impact of 82,460 foot-pounds and did not fracture, proving superior strength and toughness of the steel.

9% Nickel Steel Tanks punished at -320°F.

Burst test results. The cylindrical vessels were designed for 370 psi internal pressure (hoop stress in shell equal to 23,750 psi). These vessels were refrigerated to -320°F with liquid nitrogen and pressurized to failure. *The burst pressure for all vessels was at least four times the design pressure of 370 psi and one of the non stress-relieved vessels didn't burst until 2,300 psi.*
(See Table I)

These tests prove that USS 9% Nickel Steel has the high strength, toughness, and weldability needed for low-temperature pressure vessels.

We urge you to consider USS 9% Nickel Steel for economical low-temperature vessels. For the complete story, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS is a registered trademark

BURST TESTS 9% NICKEL STEEL CYLINDRICAL VESSELS

	PC-1	PC-2	PC-3	PC-4	C-5	PC-6
Heat Treatment	QT	NNT	QT	NNT	QT	NNT
Test Condition	AW	SR	SR	AW	AW	SR
Temp of Vessel (°F) at start of test	—308	—320	—320	—320	—320	—322
Temp. of Vessel at Failure (°F)	—304	—320	—311	—310	—302	—314
Burst pressure (psi)	2,275	1,550	2,125	2,300	2,160	2,100
Burst stress (psi)	135,510	92,920	129,800	135,730	132,500	129,100

TABLE I. Complete data are shown for burst testing of the cylindrical vessels. In each test, the vessel was filled with liquid nitrogen, supply valves were closed, and pumping continued to build up pressure to bursting point. The data show quenched and tempered (QT) or double normalized and tempered (NNT) vessels in the as-welded (AW) condition withstood greater burst pressures and stresses than did the stress-relieved (SR) vessels.

IMPACT TESTS 9% NICKEL STEEL RECTANGULAR VESSELS

	PR-1	PR-2	R-3
Heat Treatment	QT	NNT	QT
Test Condition	AW	AW	AW
Impact number	#9 of 11	#5 of 6	#7 of 7
Vessel Temp. (°F)	—293	—317	—308
Height of Drop, ft.	19	19	19
Kinetic energy of 4340 lb. weight (ft-lb)	82,460	82,460	82,460
Impact Velocity of 4340 lb. weight (fps)	35	35	35
Vessel pressure before Impact (PSI)	106	100	0
Total indentation after test (inches)	2.44	1.38	3.38

Table II. Data are shown only for the impacts which resulted in cracking or fracture of vessels PR-1 and PR-2. The two vessels were subjected to repetitive tests under increasingly severe impact and pressure conditions, leading up to the test which finally enforced failure. Additional impact tests were conducted on the failed vessels to determine further distortion and dimensional effects. For vessel R-3, which did not fail, data are shown only for the last impact.

For *maximum* strength . . . toughness . . . safety

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

Two new oil pools discovered in Illinois in November

Two new oil pools, Bourbon South in Douglas County and Dahlgren West in Jefferson County, were discovered in November.

There were three extensions to pools, as follows: one oil well each to Edinburg West pool in Christian County, Sailor Springs Consolidated pool in Clay County, and Reservoir pool in Jefferson County.

A total of 153 wells was completed in November, an average of 38 a week for the 4-week period. The November completions include 53 oil wells, a success ratio of about 35%.

Five of the November completions, including two former dry holes, were drilled deeper than 4,000 ft—one each in Hamilton and Jefferson counties, and three in Wayne County. The deepest of these, the Sun Oil Co. 1 R. W. Aydt (an old dry hole at a total depth of 3,363 ft.) was drilled deeper to 5,245 ft. The deepest zone tested was the Dutch Creek sandstone of Devonian age, topped at 5,215 ft. The well was plugged back and completed as an oil well in the Harrodsburg limestone which was topped at 4,019 ft. This is the discovery well of Dahlgren West pool.

Estimated production for Illinois for November is 6,787,000 bbl.

Mississippian oil found in Young County, Texas

Mississippian oil production is reported at a wildcat in northwestern Young County, North Texas.

Discovery well is W. A. Lofton et al. 1 Viola Hunt in Block 80, TE&L Survey, A-356, 7 miles southwest of Olney, Texas. The well flowed 384 bbl. of 42°-gravity oil daily through perforations at 5,068-72 ft. through 8/64-in. choke. Location is 1½ miles from North Swirk Mississippian field, and ½ mile south of Gunsite field, East Swirk Mississippian is the field's name.

New Morrow reservoir tapped in Panhandle

An upper Morrow Pennsylvanian zone discovery is reported by Shamrock Oil & Gas Corp. at 1-68-ODC in south-central Ochiltree County, Texas Panhandle.

The well flowed 140 bbl. of 36°-gravity oil per day through ¾-in. choke from perforations at 8,520-38 ft. Nearest production is 1¾ mile southeast in Farnsworth field. Location of the new field, West Pshigoda Upper Morrow, is in Section 68, Block 13, T&NO Survey, 12 miles southwest of the town of Perryton, Tex.

Hemphill discovery. Tonkawa Pennsylvanian oil production is reported at Mobil 1 McClure-Newcomer unit in Feldman field, Hemphill County. The well flowed 210 bbl. of oil per day through 14/64-in. choke from perforations at 7,650-63 and 7,668-80 ft. Gravity is 42°. East Feldman Tonkawa field is located in Section 44, Block 42, H&TC Survey, 11 miles east of Glazier, Tex.

Viola Ordovician oil tapped in North Texas

Montague County in North Texas has new Viola lime Ordovician oil production. Discovery well is Bennet Oil Co. 1 J. B. Irons "B", 12 miles southwest of Bowie in the J. Bradshaw Survey, A-26. New Irons Viola field is the name.

The pool discovery well flowed 210 bbl. per day from perforations at 6,510-90 ft. through ¼-in. choke

Discovery wells

WESTERN CANADA

Alberta:

Home-Baysel et al. 11-7 Enchant, LSD 11, 7-13-18w4. Glaucontic and basal quartz gas discovery. TD 3,770 ft.

Saskatchewan:

Kissinger-Gridoil 13-20 Ray, LSD 13, 20-1-31w1. Mississippian oil discovery. TD 3,947 ft.

CALIFORNIA

Sutter County:

Atlantic Oil Co. 1 U. E. Frye, SW NE SE 27-15n-1e. Dually completed gas well at 5,900-6,020 ft. and 6,140-73 ft. IP 5,250 M.c.f.d. through 18/64-in. choke with flowing pressure of 2,500 psi. TD 8,020 ft. New gas discovery 2 miles east-northeast of gas production.

KANSAS

Barber County:

Olson Oil Co. 1 Harriet V. Mills, SE SW NW 19-32s-12w. IPF 32 M.M.c.f.d., Miss. 4,520-30 ft. TD 5,045 ft. Gas discovery.

Elk County:

Texaco Inc. 1 Jessie Cummongs, SE NW SE 26-31s-9e. IP 11 BOPD, 15 BWPD, 27.5°, Miss. 2,231 ft. TD 2,590 ft.

Grant County:

Hugoton Production Co. 2-5 Sullivan, C SW¼ 5-29s-37w. IPF 2,300 M.c.f.d., Council Grove 2,689-2,813 ft. TD 5,825 ft. Gas discovery.

Kingman County:

Rupp-Ferguson Oil Co. 1 Freemeyer, C SW SE 20-27s-6w. IP 917 M.c.f.d., Miss. 3,828-30 ft. TD 4,212 ft. Gas discovery.

Stelbar Oil Corp. 1 Kostner "A", SE SE NE 1-29s-6w. IP 10 BOPD, Miss. 3,891-95, 3,912-14 ft. TD 3,999 ft.

Morton County:

Pan American Petroleum Corp. 1 Wratil

ORCO PROCESS
AVAILABLE FOR LICENSE

The ORCO PROCESSES comprise the treatment of hydrocarbon reservoirs with controlled amounts and concentrations of carbon dioxide or admixtures thereof.

These processes are generally used in connection with the secondary recovery of crude oil.

The following United States patents, all issued to and exclusively owned by Oil Recovery Corporation, relate to the ORCO PROCESSES:

Date Issued	Patent Number	
July 15, 1958	2,843,256	Methane and Carbon Dioxide Solutions in Hydrocarbons
March 3, 1959	2,875,830	Method of Recovery of Oil by Injection of Hydrocarbon Solution of Carbon Dioxide into Oil Structure
March 3, 1959	2,875,831	Dissemination of Wetting Agents in Subterranean Hydrocarbon-Bearing Formations
March 3, 1959	2,875,832	Gaseous Hydrocarbon and Carbon Dioxide Solutions in Hydrocarbons
March 3, 1959	2,875,833	Process of Recovering Oil from Oil Fields Involving the Use of Critically Carbonated Water
December 13, 1960	2,964,109	Method of Eliminating Water Resistant Coating from Bore of Injection Wells

LICENSES UNDER THESE PATENTS ARE AVAILABLE FOR USE ON SUITABLE SECONDARY RECOVERY PROPERTIES

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● MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

● The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

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Manufacturer
9 W. BRADY STREET • TULSA, OKLAHOMA

"B", C SE NE 22-31s-40w. IP 3,283 M.c.f.d., upper Morrow 5,432-36, 5,202-4 ft. TD 6,085 ft. Remote discovery.

Anadarko Production Co. 1-31 Nusser, C SE NW 31-34s-41w. IP 33,900 M.c.f.d., 3,098-3,162 ft. 3,174-84 ft. Topeka. TD 3,340 ft. Gas discovery.

Pratt County:

E. K. Edmiston 1 Gates, NW NE SE 28-28s-13w. IP 120 BOPD, 36°, Simpson, 4,418-24 ft. TD 4,512 ft. Opens Ludwick pool.

Rush County:

Thunderbird Drilling Co. 1 Well, SE NW SE 20-19s-20w. IP 90 BOPD, 9 BWPD, 41°, Cherokee 4,304-8 ft. TD 4,386 ft. Opens Old Maid Forks field.

Seward County:

Cabo Carbon Corp. 1 Floyd Massoni "B" C SW¼ 20-33s-31w. IPF 2 M.M.c.f.d., Chester 5,770-76, 5,784-96 ft. TD 6,330 ft. Gas discovery.

Stafford County:

Chief Drilling Co. 1 Kipp, NW SE NE 20-25s-13w. IP 79 BOPD, 35°, Arbuckle 4,337-42 ft. TD 4,370 ft. Opens McCandless field.

OKLAHOMA

Cimarron County:

Texaco Inc. 1 Ward Hanes, C NW NE 10-3n-9eCM. IPF 1,644 M.c.f.d., Morrow 4,545-50 ft. TD 5,650 ft. Gas discovery.

Coal County:

Tennessee Gas & Oil Co. 1 Hargrove Hudson, C NE NW 7-1n-10e. IP 114 BOPD, 133 BSW, 38°, basal McLish 8,114-18 ft., upper Oil Creek 8,366-69 ft. TD 8,781 ft. Oil discovery.

Grady County:

Cleary Petroleum Co. et. al. 1 Hilltop, C NE SW 16-8n-5w. IPF 30,500 M.c.f.d., 104 BCPD, 67°, First and Second Bromide sand 11,715-11,810 ft. Gas-condensate discovery.

Kingfisher County:

Apache Oil Corp. 1 Love unit, SW NE 13-16n-8w. IPF 1,100 M.c.f.d., Manning 7,856-76 ft. TD 8,225 ft. Gas discovery.

Jones & Pellow Oil Co. 1 Stinson, SW NE 9-18n-7w. IP 65 BOPD, Oswego 6,590-6,602 ft., Manning 7,082-95 ft., 42°, 40°. TD 8,040 ft. Dual zone oil discovery.

W. R. Yinger et al. 1 Albert E. Simunek, C NE NE 33-19n-5w. IPF 37 BOPD, 40°, Miss. 6,113-6,220 ft. TD 6,220 ft. Oil discovery.

McClain County:

Gordon Street et al. 1 Inman Estate, C NW SE 5-7n-4w. IPF 145 BOPD, Hart sand 9,302-15 ft., Osborne sand 9,595-9,685 ft. TD 10,100 ft. 43°. Oil discovery.

Muskogee County:

Allied Materials Corp. 1 L. E. Walker, SE SW NE 18-13n-18e. IPF 4,300 M.c.f.d., Dutcher 1,430-60 ft. TD 1,486 ft. Gas discovery.

Osage County:

Elam Oil Co. 1 Osage, SW SW NE 16-29n-12e. IP 1 BOPD, 1,055-59 and 1,066-72 ft. TD 1,850 ft.

Stephens County:

Hoard & Spradlin 1 King, NW SE SW 10-1n-9w. IP 15 BOPD, 45 bsw., lower Key sand 2,304-15 ft. TD 2,751 ft. Oil discovery.

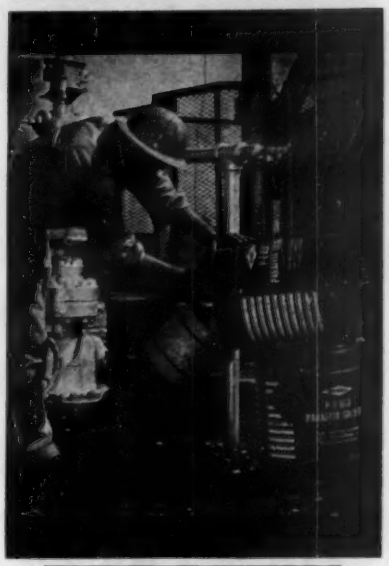
WEST CENTRAL TEXAS

Throckmorton County:

Kit Gray, Jr. 1 McKnight, 9 miles southeast of Throckmorton in Sec. 295, TE&L Sur. A-339. IPP 15 BOPD, 36°, GOR 40:1. open hole 439 ft. TD 442 ft. New oil discovery.

(Continued on page 156)

PARAFFIN PROBLEMS?



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Howard M. McDonald

Veteran Pipeliner Sets Pace

. . . for younger associates. Howard McDonald belongs to the "old school," but he's a forward-looking executive.

A 17-YEAR-OLD 110-lb. kid and his school buddy walked into the hiring office of Texas Pipe Line Co. at Ranger, Tex., in the fall of 1917.

"We hear you're hiring some men," said one.

Replied the foreman: "We sure are. Where are they?"

That's how Howard M. McDonald, fresh from the 10th grade, broke into the pipeline business. He never went back to school. But today he bears one of the most respected names in pipelining and holds down one of the most responsible jobs.

As a vice president of Texas Eastern Transmission Corp. and general manager of the Little Big Inch division, McDonald directs the operation of more than 2,000 miles of products lines from Texas to Ohio.

He belongs to a fast-disappearing breed of pipeliner—men without professional training whose spirit and inborn know-how solved the problems of moving liquids long distances underground.

One thing, however, sets him apart. His engineer-trained boss, Millard K. Neptune, senior vice president of Texas Eastern in charge of the Little Big Inch division, says of McDonald:

"He taught himself to be an engineer. I once called in a bunch of engineers and gave them an assignment. While I was talking, Mac was scribbling on the back of an envelope. He came up with an answer to the problem, and it took the engineers several days to arrive at the same figure."

Lack of professional training doesn't mean that McDonald downgrades engineers. Quite the contrary. If he had it to do over, he'd get the formal training.

But what counts is that McDonald, who learned his trade in the field, knows how to direct engineers and assess the value of their work.

Way back when . . . McDonald was born in 1900 at Weatherford, Tex., and remained there until he found he could make $75 a month helping to build pipelines. That was good money in those days.

The story of how he and his friend got their first jobs with The Texas Co. has a kicker ending. They were hired as dishwashers.

But soon McDonald was working with a construction crew, and his father's efforts to put him back in school failed. He switched to Gulf Oil Corp. and operated ditching machines and tractors while laying lines around various Texas fields.

After a brief stint for Humble Pipe Line, McDonald joined the old El Dorado Pipe Line Co. at Shreveport in 1921 and became a maintenance foreman just after his 21st birthday. He stayed with El Dorado (later Atlas Pipe Line) for 19 years and rose to division superintendent at Longview.

Pan American hired him as division superintendent for its East Texas operation in 1940. But World War II cut short his job there and he began his long association with the two lines that made transmission history, the Big Inch and the Little Big Inch.

War and more . . . The Government's War Emergency Pipeline, Inc., put

▶▶▶ Personals

William C. Henkes, Denver consulting geologist, has joined Southwood Exploration Co. and Santa Fe Corp. as geologist in Denver.

John C. Garrels, assistant general manager of Monsanto Chemical Co.'s plastics division in Springfield, Mass., has been elected deputy managing director of Monsanto Chemicals, Ltd., British subsidiary, in London. **J. R. Eck,** formerly president of Mobay Chemical Co., an affiliate, has been named assistant general manager of the plastics division in Springfield.

Horace E. Bent has joined the plastics division engineering department in Springfield. **Francis T. Goban** has joined the division's sales department, Springfield.

C. E. (Gene) Barnes has been transferred from Pure Oil Co.'s Denver office to the new Oklahoma City area exploration office as area exploration manager. **Hollis Scoggins** has been transferred from Shreveport, La., to Oklahoma City as area seismologist **Miller Goodgen,** district geologist in Tyler, Tex., has moved to Oklahoma City as area geologist. **Dale Harrison** is area land man in Oklahoma City.

E. C. Greco, senior research chemist for United Gas Corp., Shreveport, La., has been elected 1961-62 president of National Association of Corrosion Engineers. **Fred D. Stull,** superintendent of corrosion prevention for Texas Gas Transmission Corp., has been named a director of NACE.

William T. Smith, division geologist for Pan American Petroleum Corp. in Fort Worth, has been promoted to division exploration superintendent of the North Texas-New Mexico division, Fort Worth. He succeeds **William J. Nolte,** who has retired after 30 years with the company.

McDonald to work in January 1943, as a division superintendent during construction of the 24-in. Big Inch line. Later he was called on to help build the 20-in. Little Big Inch.

As the man who probably knew more about the lines than anyone else, he stayed on after the war as division superintendent under two short-time operators—William Brothers and Tennessee Gas—and finally joined Texas Eastern when it bought the two lines in the spring of 1947.

He moved to Shreveport as pipeline superintendent and by 1952 had risen to general superintendent. Two years later Texas Eastern bought the old Triangle products line in anticipation of converting it to the Little Big Inch system. McDonald managed Triangle until it was absorbed into the system, and became general manager of the Little Big Inch division under Neptune in 1957. The next year he became a Texas Eastern vice president as well.

Methods . . . Despite the fact that he's one of the "old school," McDonald keeps his eye on the future.

His only objection to new developments like automation: They're not good enough.

"Automation is not satisfactory yet, and we need more dependable communications," he said last week.

But if McDonald is forward-looking after 43 years in pipelining, he's old-fashioned in one respect. He unlocks the door of his office at Houston every day at 6:45 a.m., and he's usually there when his younger associates quit in the afternoon. What's more—and this applies only when he's not indulging in his favorite sport of fresh-water fishing—he's at the office on Saturdays, Sundays, and holidays.

"And I've never been off the job with an injury or been sick," he says with understandable pride.

That's how they made pipeliners in the old days.

Charles Betzel has been promoted to manager of laboratories for Petroleum Technologists, Inc., Dallas. **Vincent Thomas** has been promoted to manager of sales. Betzel and Thomas were formerly technical representatives. They will headquarter in Dallas.

Elmer R. Bradley and **Marcus A. Markley** have been appointed general sales managers for Sun Oil Co. Bradley will be in charge of motor-product sales, both directly and through wholesale distributors, and will direct distribution operations. Markley will be in charge of industrial, wholesale, fuel, oil, foreign, and LPG sales.

O. E. Gram, formerly with Gulf Oil Corp. in Billings, Mont., has opened offices there as consulting geologist.

Owen B. Bennett, party chief with Amerada Petroleum Corp., has been transferred from Sturgis, S. D., to Williston, N. D.

Dr. Paul J. Berrigan and **Dr. Donald W. Thompson** have joined the technical staff of Shell Development Co.'s Emeryville, Calif., research center.

John F. Hardy, vice president and general manager of Central-Del Rio Oils, Ltd., Calgary, has been named executive vice president and general manager. **A. H. Jukes** has been appointed vice president, land.

Horace Harrington, district geologist for Superior Oil Co. in Bakersfield, Calif., has been transferred to Tripoli, Libya, as manager of exploration for Libya Superior Oil Co. He will open Superior's first office in Tripoli. **Bill Winter,** geologist in the Bakersfield office, will succeed Harrington as district geologist there.

Ned C. Turner, vice president in charge of engineering and operations for Transwestern Pipeline Co., has been elected a director. **Raybourne Thompson,** of Vinson, Elkins, Weems & Searls, Houston law firm, has been named secretary of Transwestern. **William A. Koros,** Transwestern controller and assistant secretary, has been named treasurer. **J. R. Butler,** a director and one of the founders of the company, was formerly secretary-treasurer. He will continue as chairman of the executive committee.

R. T. Lowder has been appointed maintenance supervisor in the Grayville, Ill., area by Sohio Pipe Line Co. He was formerly in Centralia, Ill.

Dr. Harry E. O'Connell, project manager with Ethyl Corp., has joined Tennessee Gas Transmission Co. as project-development manager. He will work with TGT's plans for expansion and diversification.

W. A. Strauss, executive vice president of Northern Natural Gas Co., has been elected president and principal operating officer. He also becomes a director and member of the executive committee. Strauss succeeds **John Merriam,** who will continue as chairman and chief executive officer. **A. B. Dilworth,** senior vice president, has been elected a director and executive committee member.

▶▶▶ Personals

Executives of Tennessee Gas Transmission Co. have been named to head Tenneco Corp., which is being organized as TGT's principal subsidiary. **Gardiner Symonds,** chairman of Tennessee Gas, will be chairman of Tenneco; **Cecil C. Johnson,** former treasurer and senior vice president of TGT, will be president. Tenneco Corp. will have a group of subsidiaries of its

JOHNSON

GRAHAM

own, some new and some formerly managed as divisions of TGT (for details of the reorganization see news section). Tenneco Oil Co., chief of the Tenneco Corp. subsidiaries, will have Symonds as chairman, and **R. C. Graham** as president and a director. Graham formerly was president of Tennessee Gas & Oil Co. division. Other officers of Tenneco Corp. will include **Harley F. Baker,** as vice president, and **Harold Burrow, R. L. McVey,** Graham, and Johnson as directors. For Tenneco Oil, **R. R. Dean** will serve as vice chairman and **W. E. Scott, S. C. Oliphant,** and **W. C. Hildebrand** will be senior vice presidents. Tenneco Oil vice presidents will be **J. S. Collins, E. R. Karter, Leo L. Leabo, George Meason, K. G. Pearce, R. L. Sielaff, O. W. Ward,** and **A. R. West.**

Richard G. Fagin, formerly with Humble Oil & Refining Co. in New Orleans, has joined D. R. McCord & Associates, Inc., Dallas petroleum consulting firm, as senior engineer.

L. J. Maurovich has been named superintendent of the El Chaure refinery and terminal of Sinclair Venezuelan Oil Co. at Puerto la Cruz, Venezuela. He succeeds **J. J. Connelly,** who has retired after over 40 years with the Sinclair companies.

Robert L. Wright, area scout for Phillips Petroleum Co., has been elected president of the Intermountain Oil Scouts Association. He succeeds **Wayne C. Polston,** Texaco Inc., who will become vice president of the group. **Gene M. Vermillion,** El Paso Natural Gas Co., has been named secretary-treasurer.

Personals

John R. Evans, general manager of production for Standard Oil Co. (Ind.), has been elected vice president for production and a director of Pan American Petroleum Corp., subsisiary of Indiana Standard. Evans succeeds the late Whitney M. Elias. **L. Chase Ritts, Jr.,** vice president and manager of Pan Am's Texas-Louisiana Gulf Coast division in Houston, has been named coordinator of crude-oil production, purchasing, and transportation for Indiana Standard. He will headquarter in Chicago. **John C. Johnston,** manager of exploration for

EVANS

RITTS

JOHNSTON

Pan Am in Tulsa, will succeed Ritts as division manager in Houston. He also has been named vice president and a director of the company. Evans had been with Pan Am for 28 years and was serving as vice president and a director in Fort Worth before moving to Indiana Standard last year. Ritts also had held his post in Houston since 1959. Johnston was division exploration superintendent in Houston before moving to Tulsa last year as exploration manager.

Jesse R. Wilkins, Jr., and **Robert L. Kemp** will head Columbia Well Service, Inc., new Columbia, Miss., firm.

Michael J. Breaux, production engineer with Mobil Oil Co. in Ulysses, Kans., has been transferred to Mobil Chemical Co. in Beaumont, Tex., as production engineer.

A. J. Organ has been named vice president and general manager of Llano Colombia Corp. in Bogota, Colombia. Llano Colombia, a subsidiary of Llano Drilling Co., Midland, Tex., does general drilling contracting work in northern South America. **Otis Good** will continue as general superintendent of the company in Barranquilla, Colombia.

Jesse S. Wilson, Jr., has been named assistant supervisor of materials at the Lockport, Ill., refinery of Texaco Inc. He had been senior cost clerk at the Eagle Point refinery, Westville, N. J.

W. C. Brodhead, marine coordinator for Gulf Oil Corp. in New York, has been transferred to Pittsburgh as departmental coordinator of the transportation department. He will be responsible for development of transportation plans and programs.

W. R. (Jake) Jacoby, refinery technical director for Cities Service Oil Co., Ltd., has been named superintendent of operations at the company's Trafalgar refinery, near Toronto. **Kenneth G. Seabright** will succeed Jacoby.

Dean A. McGee, president of Kerr-McGee Oil Industries, Inc., has been named chairman of the independent oil-refineries committee of Project HOPE, the hospital ship medical-training center. He will head an industry drive to raise funds for the ship.

J. A. Champion, Corpus Christi, Tex., division geologist for Shell Oil Co., has been named Houston area geologist. Champion joined Shell in 1947. He had been San Antonio district geologist and senior geologist in Houston before being named Corpus Christi division geologist in 1955.

Franklin E. McGee, group engineer in the Cleveland manufacturing department of Standard Oil Co. (Ohio), has been given a 2-year loan assignment with Iranian Oil Refining Co., one of the Iranian Consortium operating companies. McGee will serve as mechanical engineer in refinery construction at Iranian Oil Refining's Abadan refinery.

Darrell Smith, Texaco Inc., has been elected chairman of the Houston chapter of API's Division of Production. Other new officers are **J. F. (Bud) Hendrickson,** Phillips Petroleum Co., first vice chairman; **Len Williams,** Atlantic Refining Co., second vice chairman; **George H. Kimbrell,** Reed Roller Bit Co., secretary-treasurer; and **R. W. (Russ) McMurry,** Hydril Co., assistant secretary-treasurer. Committee chairmen will be **Frank Zimmerman,** Lion Oil Co. division of Monsanto Chemical Co., program; **Charles E. Richards, Jr.,** Southwest Industries, Inc., and **Elmer Simmons,** Parkersburg Rig & Reel Co., membership; **E. J. Frederick,** Baash-Ross division of Joy Manufacturing Co., and **B. G. Barefield,** Oil Center Tool Co., entertainment.

Dr. B. B. Weatherby will retire December 31 as senior vice president of Amerada Petroleum Co. and president of Amerada's subsidiary, Geophysical Research Corp. Weatherby will continue as a director of Amerada and will be active particularly in the company's foreign operations and in special geophysical and technical problems. He joined Amerada in 1925 and has been in Tulsa since 1929. He is a past president of the Society of Exploration Geophysicists and a former editor of the American Association of Petroleum Geologists.

A. P. Cormier has been named district sales chemical representative for Phillips Chemical Co. in Jennings, La. He had been with Phillips Petroleum in Corpus Christi, Tex.

Donovan S. Duvall has been named assistant chief chemist at the Lima, Ohio, refinery of Standard Oil Co. (Ohio). He had been in the development division, Cleveland.

M. K. Grigg, Scott City Oil Co., Scott City, Kans., has been elected president of Kansas Oil Men's Association. **Charles Dungey,** Dungey & Son, Winfield, has been named vice president.

Stanford J. Hetzel has been named market analyst in Sun Oil Co.'s new commercial-development division, research and engineering department. **Raymond F. Winch** has been named project analyst in the new division. Hetzel had been on the staff of the assistant director for petrochemicals. Winch was assigned to the staff of the assistant director for motor products in research and development.

SCOTT

L. E. (Larry) Scott, division land supervisor for Standard Oil Co. of California in Los Angeles, has joined Pauley Petroleum, Inc., as assistant to the president, **Edwin W. Pauley.** Scott, a native Texan and graduate of the University of Texas, had been associated with Standard of California and subsidiaries since 1948. He worked with the company in Oklahoma, Pennsylvania, Florida, Louisiana, Georgia, and Alabama as well as California.

Albert Gregersen, coordinator of Gulf Oil Corp.'s production department, has been appointed area representative for Denmark, Sweden, Norway, and Finland. Gregersen joined Gulf in 1945 as vice president and branch manager of Danish American Prospecting Co., then a Gulf subsidiary.

He moved to New York in 1951 as government-relations advisor for Gulf's foreign-production division. He later was executive assistant to the vice president, foreign-production division; staff representative for Eastern Hemisphere production, and Gulf Eastern Co. vice president in London. He returned to Pittsburgh last year as production coordinator.

Richard L. Martin has returned to Jersey Production Research Co.'s Tulsa research center after a year's special assignment with Esso Standard (Libya), Inc., in Bengasi. He has been named section head in the production-research division at the research center.

Joel H. Hirsch, chief development engineer for Gulf Research & Development Co. in Harmarville, Pa., has been named director of the Harmarville laboratory's new development-engineering division. Hirsch joined Gulf Research in 1944 as head of process-research engineering in the chemistry division. He became chief development engineer in 1952.

Glen F. Johnson, Mobil Oil Co.'s Houston district geologist, has been promoted to superintendent of the Wichita exploration district.

John J. McCarthy, former vice president of Eastern States Petroleum & Chemical Corp., has joined Cirillo Brothers, New York independent marketing firm.

Harold G. Houlton, director of research and development for Ashland Oil & Refining Co., has been named coordinator of petrochemical development. **Thorwell H. Paulsen,** coordinator of research and refining, will succeed Houlton as research and development director. **William H. Gammon,** senior chemical engineer, has been named assistant director of research and development.

John F. Redmond, manager of Shell Oil Co.'s exploration and production economics department in New York, has been named vice president in charge of exploration and production for Shell Oil Co. of Canada, Ltd., in Calgary. **E. G. Christianson,** who has been on special assignment with the exploration and production economics department since May, will succeed Redmond as department manager. Christianson is a former division production manager and chief exploitation engineer in the Denver area. Redmond has been with Shell since 1936. He was manager of the Oklahoma production division before becoming manager of the New York exploitation-engineering department in 1955 and manager of exploration and production economics in 1959.

▶▶▶ Personals

S. N. Bell, manager of marketing for Continental Oil Co.'s northern region in Kansas City, has been appointed manager of marketing for the 8-state Rocky Mountain region. He will headquarter in Denver. Bell succeeds **H. F. van der Voort,** who was named general manager of marketing several weeks ago. Bell was assistant division marketing manager in Denver before being named Salt Lake City division marketing manager in 1949. He served as marketing manager in Fort Worth and Chicago divisions before being named northern region manager in 1955.

BELL

Jack C. Stipe, geologist in New Orleans for Kerr-McGee Oil Industries, Inc., has been named district geologist in charge of exploration in the southern division. He will headquarter in New Orleans. **Robert Glenn Hughes,** land man in New Orleans, has been named district land man in the new Pittsburgh office.

William J. Conroy, Gulf Oil Corp., has been elected president of the Denver Landmen's Association. New vice presidents are **Glenn Berger,** Midwest Oil Corp.; **Max A. Pischel,** Phillips Petroleum Co.; **Glenn St. Aubyn,** independent operator; **Ray T. Rader,** independent; and **Melvin E. Thrash,** Continental Oil Co.

▶▶▶ Deaths

William Nuba Strong, 80, retired mechanical engineer for the old Independent Easter Torpedo Co., died December 6 in a Tulsa hospital after a 2-year illness. Strong was with the oil-well torpedo firm 30 years before retiring in 1950.

Charles Bunje, Jr., 79, retired vice president and manager of pipeline operations for Ohio Oil Co., died December 11 in Santa Monica, Calif. Bunje joined Ohio in 1907 as a pipeline construction engineer. He was elected vice president and manager of pipelines in 1942 and retired in 1946.

Dr. Charles L. Nickolls, long a member of the chemical-engineering faculty at Oklahoma State University, Stillwater, died recently after a heart attaek. Nickolls retired last May.

Dallas Wells, 50, driller with Kerr-McGee Oil Industries, Inc., in Baggs, Wyo., died December 6 near Craig, Colo. He had been with Kermac since 1934.

N. C. Loomis, 53, director of product procurement for Gulf Oil Corp., died December 12 in a New York hospital after a brief illness.

Lloyd Drevescraft, Denver consulting geologist, died December 8 in Denver.

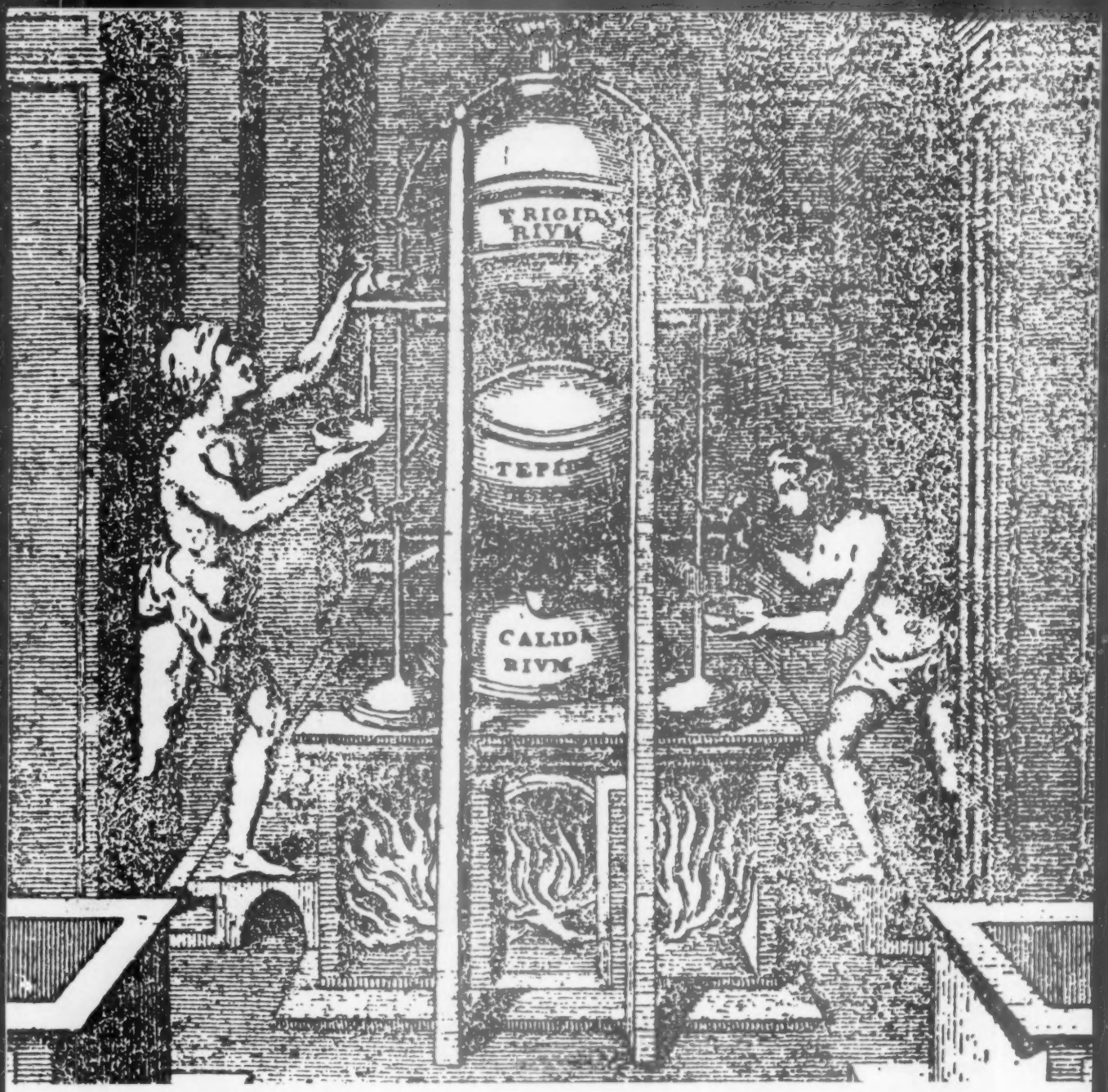
John Mesaros, Jr., 36, assistant technical-service division director in Phillips Petroleum Co.'s production department, Bartlesville, Okla., died December 12 in a Bartlesville hospital after a 3-month illness. Mesaros had been with Phillips since 1948.

Carl G. Grabe, 75, president of Rex Oil Co., Los Angeles, died December 6 in Los Angeles. He had been with Rex Oil since 1922.

Harold J. Gearin, 56, sales manager for Southern Pacific Pipe Lines, Inc., Los Angeles, died December 5 after a heart attack. Gearin had been with Shamrock Petroleum, Ltd., Shell Oil Co., and Fluor Corp. before joining Southern Pacific.

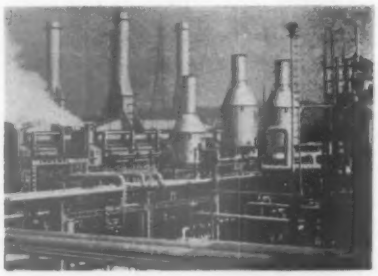
Wayne Howard Hammon, 67, Wichita Falls, Tex., independent oil man, died December 7 at his home. He had been active in the oil industry in Texas since 1924.

M. J. Florance, New Mexico independent operator, died December 7 in Albuquerque after a brief illness.



Where would we be without a still .....?

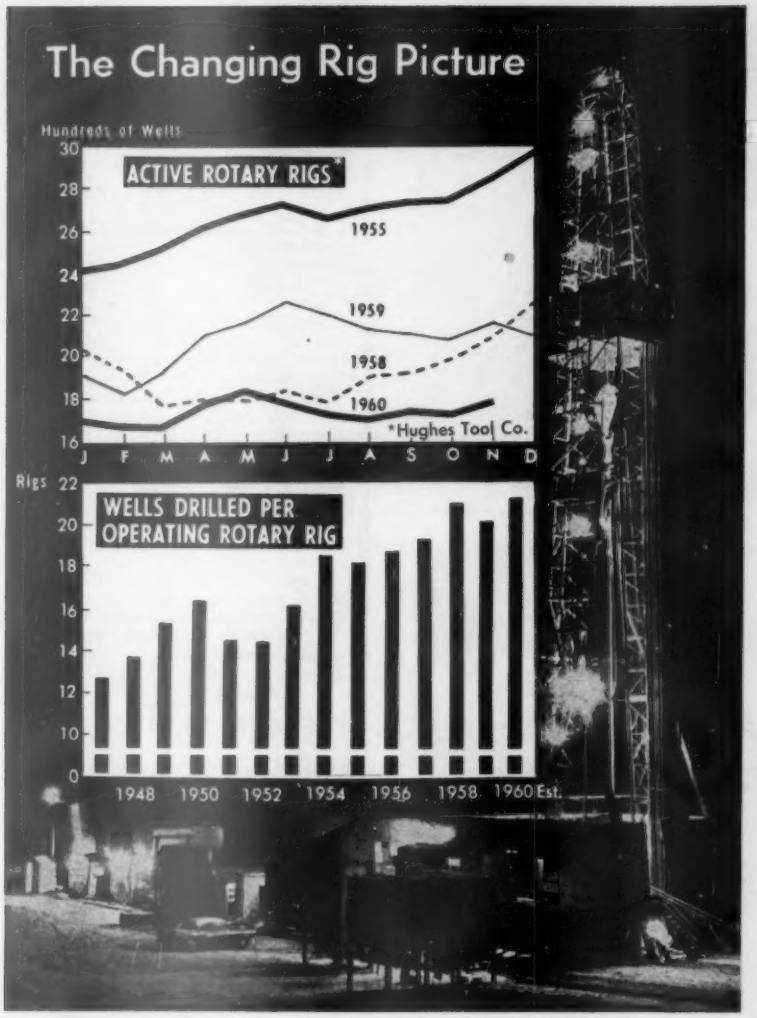
Without a still or two, many of us would find it dull, dry world. But vastly more important, without the huge, complicated stills that produce the myriad oil products essential for our modern life—for refineries are basically stills—it would be a different world indeed. For the past thirty years, the Japan Gasoline Company has designed and built some of the finest petroleum and petro-chemical plants in Japan. Be sure to consult our staff of experts in the field for all types of advice and assistance when building or enlarging your plant.



Engineers & Constructors

JGC **JAPAN GASOLINE CO., LTD.**

New Otemachi Bldg., 2-4, Otemachi,
Chiyoda-ku, Tokyo, Japan.



More wells per rig will mean more wells per year

BY JOHN C. CASPER

OPERATORS have used fewer rotary rigs this year than in any other year since 1946, but rotary-well completions will be well above the postwar low.

Rotary-rig average for the first 49 weeks of this year was 1,745. Allowing for normal increases in the first part of December and for a dropoff during the holiday season, the average for the year will be about 1,747. Figures are from Hughes Tool Co. report and cover only those rigs operating in the United States.

The low record for 1960 is shown by the bottom line of the upper chart. Rotary drilling was off to a slow start at the first of the year. The report of January 4 carried a total of 1,853 rigs, but that report actually measured activity at the end of 1959. Except for the one report of 1,710 rigs on February 1, the weekly count stayed below 1,700 for all of the first quarter.

Note the flurry of activity in April and May that was followed by a definite sag during the summer months. The average for August was down to 1,702 rigs or 20% under the total for August last year.

The drilling pattern for a typical year calls for sharp increases in rig activity in the third and four quarters. This normal upturn shows up in lines for 1955 and 1958. Activity for the last half of this year has tended to follow this normal seasonal pattern. There has been gradual improvement in the rig picture since the end of August, and December will be the best month in a poor year.

The major reason for the big decline in active rigs has been the sharp reduction in the over-all drilling program for 1960. Operators have trimmed rotary drilling by better than 11% this year. Rotary completions added up to 41,623 wells last year but will be down to a little over 36,900 this year. But, drilling efficiency is also a factor in the decline in number of operating rigs.

Bars on the bottom chart give a picture of this trend toward more efficient operations and faster completions. Each bar represents the number of wells drilled by the average operating rotary rig during the year.

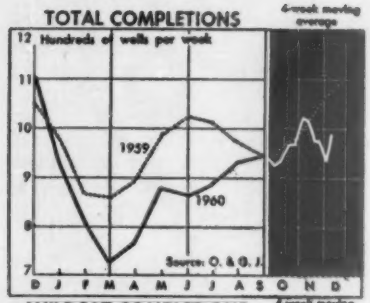
For the year 1947, the average rig accounted for fewer than 13 holes. There has been a gradual increase in holes per rig. This year's average is estimated at 21.2 wells for a gain of about 65% over 1947.

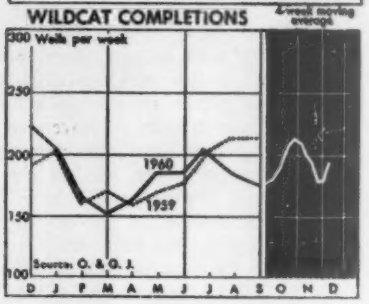
This increase in rotary completions per rig must be considered when current rig activity is compared with records for past years. More wells per rig means more wells per year.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,137,300	UP	158,900	UP	7,284
Crude stocks	238,291,000	UP	1,508,000	DOWN	14,322,000
Completions	1,157	UP	241	DOWN	128
Refinery runs	7,887,000	UP	53,000	DOWN	88,000
Gasoline stocks	187,136,000	DOWN	106,000	UP	5,886,000
Kerosine stocks	35,353,000	DOWN	1,549,000	UP	6,340,000
Distillate stocks	167,038,000	DOWN	5,604,000	UP	6,551,000
Residual stocks	48,820,000	DOWN	519,000	DOWN	5,062,000
Four-product stocks	438,347,000	DOWN	7,778,000	UP	13,715,000
Total imports	1,942,200	UP	290,800	UP	203,900

Active Rotary Rigs





	12-12-60	12-5-60	12-14-59
Alabama	6	6	5
Alaska	4	8	(†)
Arkansas	9	10	18
Arizona	1	1	0
California	83	69	97
Land	81	67	90
Offshore	2	2	7
Colorado	31	34	36
Florida	4	3	2
Land	2	2	2
Offshore	2	1	0
Georgia	2	2	0
Illinois	40	34	47
Indiana	13	8	5
Kansas	127	129	153
Kentucky	3	7	7
Louisiana	274	278	320
North	35	36	39
S. Inland waters	94	101	112
S. Land	96	88	115
Offshore	49	53	54
Michigan	34	31	35
Mississippi	53	47	79
Missouri	2	1	1
Montana	31	24	25
Nebraska	21	23	29
Nevada	1	0	0
New Mexico	112	116	132
New York	2	2	0
North Dakota	15	10	28
Ohio	6	5	0
Oklahoma	207	212	255
Pennsylvania	12	12	12
South Dakota	0	1	4
Tennessee	1	1	0
Texas	657	650	775
S. Inland waters	7	7	6
S. Land	192	177	198
Offshore	2	2	0
North	66	59	200
Panhandle	56	60	(*)
East	52	53	(*)
West Central	‡160	‡168	236
West	122	124	135
Utah	32	33	30
Washington	1	1	1
West Virginia	6	6	4
Wisconsin	1	1	0
Wyoming	72	70	81
Total U. S.	1,863	1,835	2,181
Western Canada	163	153	213
Eastern Canada	0	0	1
Grand total	2,026	1,988	2,395

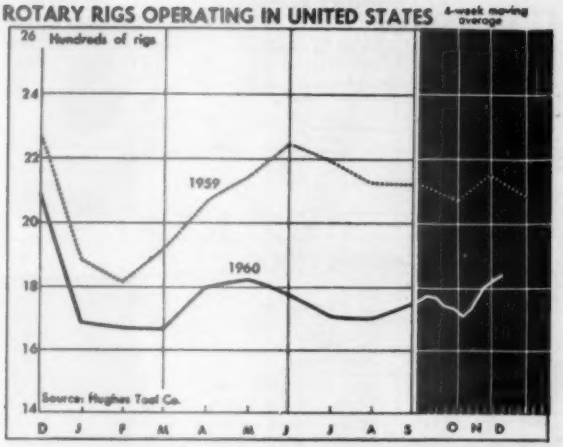
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60. ‡Stephens and Eastland counties now included in West Central Texas.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 10, 1960

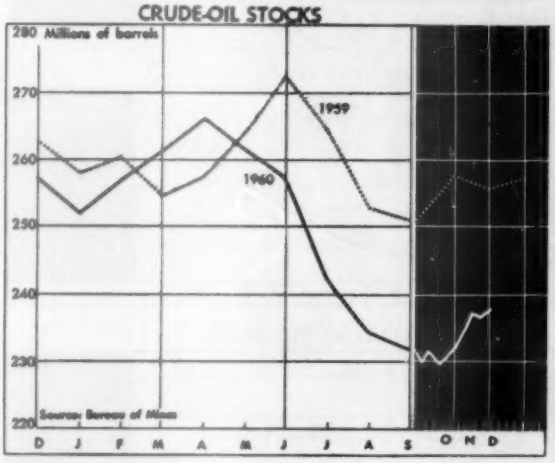
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Arkansas	24	9	0	0	15	0	90,804	586	811	3	0	0	0	3	144	143
California	50	38	0	2	9	1	148,530	1,633	1,460	5	0	0	0	5	289	387
Colorado	24	2	0	12	10	0	110,307	637	743	7	0	0	1	6	315	420
Illinois	50	15	0	0	20	15	106,005	2,225	2,247	10	1	0	0	9	471	377
Indiana	17	4	0	1	11	1	22,280	1,003	818	7	0	0	1	6	354	278
Kansas	120	52	0	7	48	13	291,045	3,961	3,773	32	2	0	1	29	1,006	1,012
Kentucky	17	4	0	1	12	0	22,848	2,052	3,056	1	0	0	0	1	214	354
Louisiana	99	46	10	5	38	0	697,623	3,482	3,599	14	0	2	1	11	528	480
North	43	20	0	5	18	0	117,315	1,374	1,434	6	0	0	1	5	257	220
South	47	22	7	0	18	0	469,252	1,638	1,771	5	0	1	0	4	237	245
Offshore	9	4	3	0	2	0	111,056	470	394	3	0	1	0	2	34	15
Michigan	18	7	0	1	10	0	56,454	891	625	8	0	0	0	8	245	178
Mississippi	17	2	1	1	13	0	133,295	644	606	9	0	0	0	9	252	266
Montana	6	1	0	0	5	0	21,489	323	323	5	0	0	0	5	155	115
Nebraska	14	4	0	0	10	0	68,971	824	860	6	0	0	0	6	363	380
New Mexico	40	19	0	12	9	0	221,401	1,761	2,000	4	0	0	0	4	244	242
West	15	3	0	12	0	0	84,087	643	881	0	0	0	0	0	69	63
East	25	16	0	0	9	0	137,314	1,118	1,119	4	0	0	0	4	175	179
New York	7	0	0	4	3	0	19,931	302	279	4	0	0	1	3	43	22
North Dakota	7	5	0	0	2	0	42,574	273	412	1	0	0	0	1	80	77
Ohio	24	6	0	4	12	2	57,136	1,017	1,038	2	0	0	0	2	49	31
Oklahoma	139	69	1	10	25	34	415,287	4,487	5,172	15	6	1	2	6	675	787
Pennsylvania	71	20	0	19	9	23	204,725	†834	581	0	0	0	0	0	16	21
Texas	353	169	16	17	139	12	1,567,343	14,727	17,643	82	5	3	4	70	3,019	3,357
Dist. 1	16	5	1	0	10	0	47,097	1,055	1,027	4	0	0	0	4	373	313
Dist. 2	23	2	2	2	17	0	168,009	721	771	7	0	0	0	7	179	224
Dist. 3	24	7	4	0	13	0	187,244	1,106	1,122	4	0	0	0	4	212	222
Dist. 4	18	7	0	5	6	0	119,064	1,006	1,274	5	0	0	1	4	278	322
East	20	12	1	0	7	0	104,482	1,238	1,187	6	1	1	0	4	256	234
Dist. 7-B	69	34	1	4	30	0	209,575	2,099	2,491	25	1	1	3	20	600	664
West	101	57	5	0	36	3	506,862	3,770	5,240	23	2	1	0	20	598	716
Dist. 9	66	35	2	1	19	9	164,973	2,749	3,327	8	1	0	0	7	468	555
Dist. 10	16	10	0	5	1	0	60,037	983	1,204	0	0	0	0	0	55	107
Utah	7	3	0	2	2	0	39,561	230	290	3	0	0	1	2	89	88
West Virginia	19	1	0	15	3	0	46,364	810	750	0	0	0	0	0	9	28
Wyoming	17	10	0	0	7	0	92,211	1,007	921	5	1	0	0	4	405	339
Miscellaneous*	17	1	0	0	16	0	27,694	262	223	17	1	0	0	16	180	113
Total U. S.	1,157	487	28	113	428	101	4,503,878	†43,971	48,230	240	16	6	12	206	9,145	9,495
Previous week	916	495	18	64	279	60	3,573,291	.....	.....	182	20	3	8	151	.....	.....
Cum. 1960	†43,971	19,871	1,257	3,741	16,562	2,540	180,327,444	.....	.....	9,145	825	105	314	7,901	.....	.....
Cum. 1959	48,230	24,066	1,175	3,560	18,075	1,354	198,206,432	.....	.....	9,495	838	103	311	8,243	.....	.....
Western Canada	79	55	0	7	16	1	455,073	2,185	2,298	16	4	0	2	10	565	636

*Mo., Tenn., Ariz., Wash., Ore. †Revised.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	12-3-60	11-26-60	12-5-59
Pennsylvania	2,330	2,344	2,423
Other Appalachian	1,343	1,299	2,141
Illinois, Indiana, Michigan	9,280	9,009	10,217
Nebraska and North Dakota	2,952	2,889	3,052
Kansas	8,861	8,956	9,436
Oklahoma	14,900	15,197	15,849
Arkansas	1,936	1,853	2,163
Louisiana	18,769	18,448	18,487
North	3,109	3,247	3,398
South	15,660	15,201	15,089
Mississippi, Alabama, Florida	2,196	2,051	2,240
New Mexico	8,553	8,292	8,322
Texas	99,570	98,598	109,908
East Texas	7,317	7,422	7,816
West Texas	46,736	46,386	51,606
Texas Gulf	17,834	17,324	19,919
Other Texas	27,683	27,466	30,567
Wyoming	16,354	16,397	17,044
Other Rocky Mountain	10,355	10,210	9,375
California	26,309	25,582	28,546
Foreign	†14,583	15,658	13,410
Total	**238,291**	236,783	252,613

*Bureau of Mines. †Includes 4,672,000 bbl. in California.

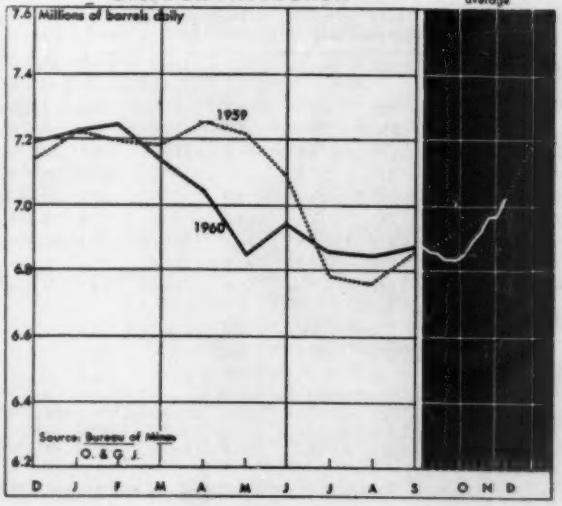
DAILY AVERAGE CRUDE PRODUCTION FOR WEEK

	December 10, 1960			Dec. 3
	Crude oil	Lease Condensate	Total	total
Alabama	21,550	.....	21,550	21,375
Arkansas	74,350	150	74,500	74,900
California	834,000	.....	834,000	833,500
Colorado	132,100	.....	132,100	132,900
Eastern	39,600	.....	39,600	39,800
Florida	875	.....	875	925
Illinois	220,700	.....	220,700	221,600
Indiana	33,100	.....	33,100	32,200
Kansas	†304,750	.....	†304,750	†294,025
Kentucky	59,100	.....	59,100	58,400
Louisiana	968,200	135,250	1,103,450	1,102,875
North	105,200	5,250	110,450	110,600
South	863,000	130,000	993,000	992,275
Michigan	48,500	.....	48,500	48,400
Mississippi	146,775	4,100	150,875	150,525
Montana	82,100	.....	82,100	82,800
Nebraska	65,300	.....	65,300	66,200
Nevada	50	.....	50	50
New Mexico	292,000	8,500	300,500	297,650
North Dakota	65,600	.....	65,600	66,000
Oklahoma	†522,900	.....	†522,900	†481,400
Texas	2,500,000	90,000	2,590,000	2,499,275
Dist. 1	44,000	3,200	47,200	46,475
Dist. 2	108,000	8,300	116,300	109,875
Dist 3	320,000	38,350	358,350	345,500
Dist 4	179,000	12,200	191,200	184,775
Dist 5	27,000	500	27,500	26,075
Dist. 6	109,000	9,800	118,800	113,800
East Texas field	133,000	.....	133,000	127,275
Dist. 7-B	123,000	400	123,400	121,975
Dist. 7-C	117,000	3,150	120,150	118,725
Dist. 8	1,041,000	10,400	1,051,400	1,004,250
Dist 9	199,000	2,000	201,000	198,850
Dist. 10	100,000	1,700	101,700	101,700
Utah	116,100	.....	116,100	106,800
Wyoming	370,200	.....	370,200	365,100
Others	‡1,450	.....	‡1,450	‡1,700
Total U. S.	6,899,300	238,000	**7,137,300**	6,978,400
Change from previous week, up			**158,900**	
Canada	†489,000	.....	†489,000	†515,500

Total U. S. production—Jan. 1-Dec. 3 ..... 2,421,611,700 bbl.
Same period last year (crude plus cond.) ..... *2,423,332,200 bbl.

*Includes 65,223,900 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

CRUDE-OIL PRODUCTION



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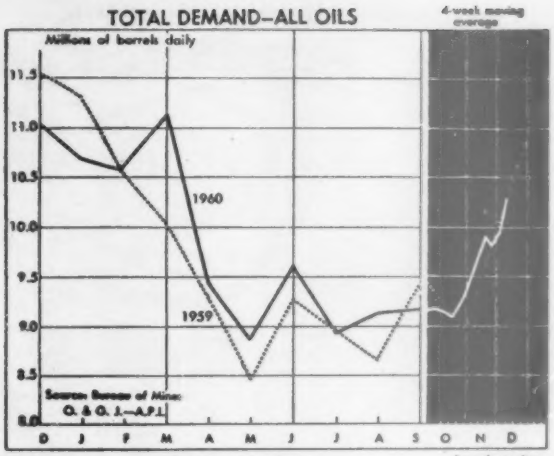

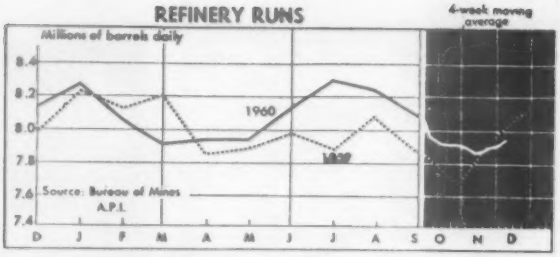

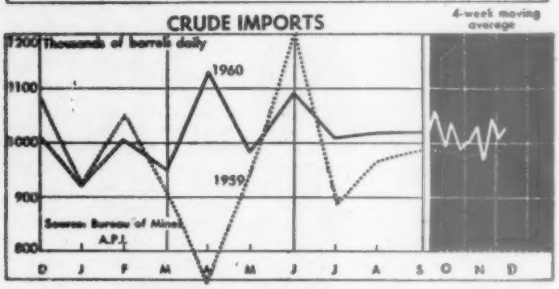

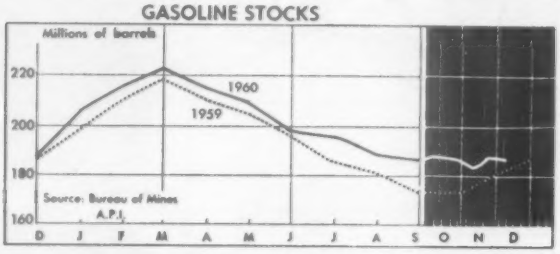

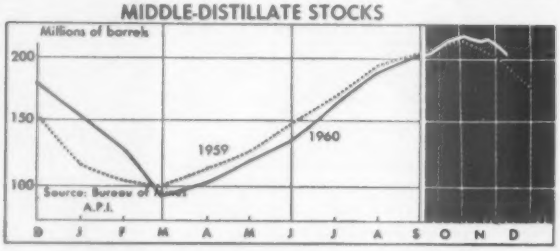

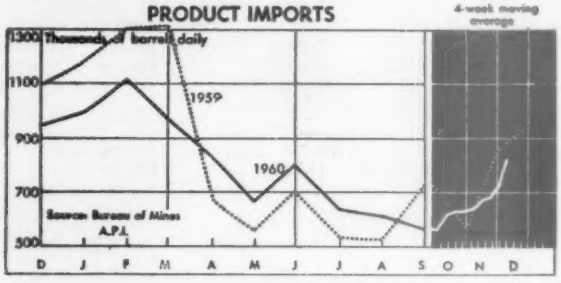

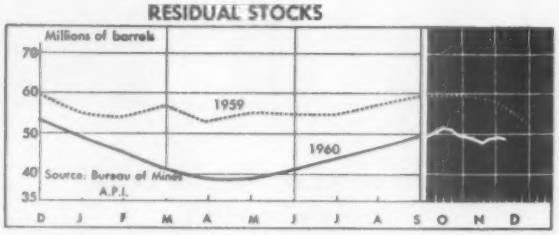

API REFINERY REPORT—DECEMBER 9, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,043	464.1	24.1	330.0	151.1	44,075	14,714	67,703	14,579	1,119	524.9	39.8	359.0	149.4
Appalachian:														
District 1	107	48.6	6.0	27.1	15.0	5,692	762	4,396	504	104	42.9	3.7	23.1	14.8
District 2	101	54.9	8.0	18.1	13.9	3,076	496	1,789	317	110	55.3	7.7	19.5	20.2
Ind., Ill., Ky. ..	1,376	736.0	82.7	288.1	200.6	30,134	7,288	29,096	6,690	1,548	798.6	82.6	359.4	231.7
Minn., Wis., Dak.	122	55.1	3.3	27.6	17.3	6,675	1,382	8,192	524	121	58.9	5.6	30.7	18.1
Okla., Kans., Mo.	717	427.3	11.4	193.9	22.1	16,282	1,446	13,984	937	699	381.5	15.5	199.5	26.1
Inland Texas ..	282	217.1	11.9	45.1	17.4	6,613	609	1,625	2,583	291	211.3	9.5	48.5	22.0
Texas Gulf Coast	1,879	1,017.6	146.1	503.1	158.4	25,269	3,367	15,325	5,316	1,877	980.1	117.9	460.1	154.5
La. Gulf Coast..	670	369.0	84.0	117.6	51.6	10,838	2,481	5,547	1,406	714	363.0	87.0	163.5	47.5
N. La. and Ark..	101	47.6	3.9	19.4	6.3	5,458	947	3,010	159	101	46.7	6.7	23.5	8.1
Rocky Mountain:														
New Mexico .	23	12.0	0.4	4.3	3.0	835	42	145	8	23	14.2	0.6	4.1	2.3
Other	272	133.7	4.4	63.1	27.9	5,537	341	2,930	1,168	293	141.9	3.9	69.6	34.4
West Coast	1,194	527.1	32.1	199.6	266.6	26,652	1,478	13,296	14,629	1,143	534.7	4.8	178.5	277.5
Dec. 9, 1960	7,887	4,110.1	418.3	1,837.0	951.2	187,136	35,353	167,038	48,820	8,143	4,154.0	385.3	1,939.0	1,006.6
Dec. 2, 1960	7,834	4,150.4	393.6	1,847.7	958.7	187,242	36,902	172,642	49,339	.....	.....	.....	.....	.....
Dec. 11, 1959	7,975	4,036.3	337.4	1,949.0	993.4	181,250	29,013	160,487	53,882	.....	.....	.....	.....	.....

At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm Said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.06
Midale C	1.69
Venezuela:	
Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-NY, clean (ATRS+10%)	$3.14
Gulf-NY, dirty (ATRS−5%)	2.71
Carib.-NY, dirty (ATRS−25%)	2.06
PG-UK, dirty (Scale−35%) (37s. 4d.)	5.24

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
Regular (91 octane)	12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00
Regular (92 octane)	11.25
Premium (98 octane)	12.25
California (rack) Los Angeles:	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125-10.25
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.625-10.875
★ Diesel oil (58 d.i. and above)	10.25-10.50
★ Distillate No. 1	10.25-10.50
★ Distillate No. 2	9.25-9.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.00-9.25
Distillate No. 2	8.25
New York Harbor (barges):	
★ Kerosine 41-43	10.65
★ Distillate No. 2	9.65
★ Diesel fuel, 48-52 d.i.	10.05
Caribbean area (cargoes):	
Distillate No. 2	8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.90
Gulf Coast (cargoes):	
Bunker C fuel	2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C	2.10
California (rack):	
Bunker C fuel, Los Angeles	2.25

(Continued from page 145)

NEBRASKA

Dundy County, Pierce Lake:
Sunray Mid-Continent Oil Co. 1 Stroup, C NE SE 8-2n-37w. IPP 149 BOPD, Lansing-Kansas City 4,138½-4,309 ft. TD 4,510 ft. Lansing-Kansas City discovery, new field.

NEW MEXICO

Lea County:
Humble Oil & Refining Co. 20-M New Mexico State, 29-22s-37e. IPF 80 BOPD, ¼-in. choke, Queen 3,622-50 ft.. 35.2°, GOR 5,854:1, TP 630 psi., packer; IPF 20 BO 38 b.s. and w. per 24 hours, 38.2°, Drinkard 6,452-6,588 ft. TD 6,840 ft. PBTD 6,590 ft. Dual completion. Drinkard discovery in Langley Matix field.

NORTH DAKOTA

Bottineau County, South Westhope area:
Cardinal Petroleum Co. 1-B Jensen, C NE SE 13-162n-80w. IPP 55 BO, 8 BWPD, 38°, Spearfish-Madison open hole 3,386-3,411 ft. TD 3,411 ft. Madison discovery, new field.

NORTH TEXAS

Archer County:
Burt Drilling Co. 4 B. D. Ikard, Joseph Levine Sur. A-260. IPP 168 BOPD, 42°, GOR 400:1. Open hole Bryson sand 3,248 ft. TD 3,254 ft. New oil discovery in Ikard field.

WEST TEXAS

Garza County:
Shell Oil Co. 1-G J. B. Slaughter. OWWO. 15 miles south of Post in Sec. 3, J. J. Koonsman Sur. A-1162. IPP 130 BOPD, plus 24° water, 32.4°, GOR 40:1. Ellenburger 8,330-46 ft. TD 8,374 ft. PBTD 8,355 ft. New oil discovery.
Pecos County:
Shell Oil Co. and Humble Oil & Refining Co. 1 Blackstone-Slaughter, 5 miles southwest of Sheffield in Sec. 19, Blk. A-2, TCRR Sur. IPCAOF 5,600 M.c.f.d., Penn. detrital 8,190-8,310 ft.; IPCAOF Connell 9,993-10,012 ft. 12 M.M.c.f.d.; IPCAOF Ellenburger 16,500 M.c.f.d., 10,050-60 and 10,082-92 ft. TD 10,800 ft. PBTD 10,122 ft. Triple-zone discovery.
Schleicher County:
Fletcher Oil & Gas Corp. 1 A. B. Thomerson, 15 miles northeast of Eldorado in Sec. 66, Blk. H, GH&SA Sur. IPF 345 BOPD, 16/64-in. choke, 44, GOR 1,550:1, TP 120 psi., CP 420 psi. Canyon sand 4,788-4,802 ft. TD 5,580 ft. New oil discovery.

UTAH

Uintah County, Fence Canyon unit:
Texaco Inc. 1 unit, NE SE 36-15s-22e. IPF 3,100 M.c.f.d., Dakota 8,544-80 ft. TD 10,348 ft. Dakota discovery, new field.

Oil test in gas play turns up as dry hole

A TEST drilled ½ mile northwest of the only oil producer in California's Sacramento Valley has been plugged as a dry hole.

Shell Oil Co. took the 2 McCune in Solana County to a total depth of 5,600 ft. before abandoning the hole. The 2 McCune was drilled in 32-8n-1e, in the same section with Texaco Inc.'s 1 McCune. The Texaco well was completed as a gas producer, but started making crude after it was shut in 6 months. The oil is coming from about 5,550 ft.

The McCune wells are in Winters gas field. Texaco has completed one gas well near the oil producer, but no other wells have flowed oil as yet.

California's McMullin Ranch field expands

Production in California's McMullin Ranch field has moved a half-mile east by the completion of the ninth well in the field, which was discovered in May.

Great Basins Petroleum Corp., Los Angeles, has completed the 23X-30 Kromann in 30-3s-7e in San Joaquin County in the Blewett sand. The well flowed at the rate of 7,644 M.c.f.d. through a ½-in. choke from perforations at about 5,300 ft. Total depth was 6,600 ft. The Kromann well is the sixth completion in the field for Great Basins.

The deliverability of the nine wells in the field is estimated at 66 M.M. c.f.d. There are six or seven additional locations in the field, which is being developed on 160-acre spacing.

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FOR SALE: Clark RA-8 crankshaft in excellent condition, main journals and crankpins refinished to standard undersize, prompt delivery. Guaranteed as new. Washington Iron Works, Inc., P. O. Box 38, Sherman, Texas.

NEW 7", 20#, J-55, ST&C, 8 Rd. Range 2, Casing. Some Seamless, Some ERW, All Domestic. 45,000'. $2.25 per Foot, Our Racks, Blackwell, Oklahoma. Arkansas Louisiana Gas Company, Tel. 422-2141, Ext. 246, P. O. Box 1734, Shreveport, Louisiana.

EQUIPMENT WANTED

13⅝" BJ automatic casing spider w/slips. 10¾" BJ slip type side door elevator w/slips. Advise price and location. Box M-193, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

— WANTED —
Production Superintendent
Must be experienced in all phases of production, water-flooding, drilling, well completion and work over in Oklahoma. Salary open for qualified top man. Age 35-45. Address reply:
Box M-188, The Oil and Gas Journal
Tulsa, Oklahoma

GAS DISTRIBUTION ENGINEERS

Engineers experienced in all phases of the engineering and installation of gas distribution systems for cities and towns, including feasibility studies, design, preparation of specifications, field location, and supervision of construction, inspection, testing, conversion and start-up. Openings for Project Manager and Project Engineers.

Salary commensurate with experience.

Send summary of experience and education:
BOX M-194
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

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HELP WANTED

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Long established utility desires permanent services of a combustion engineer. Must be a college engineer graduate and have at least five years experience in the combustion engineering field. Interested applicants please send resume including photograph with first reply to Northwest Natural Gas Company, Personnel Office, 132 N.W. 2nd & Flanders, Portland, Oregon.

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RIG MECHANICS
TOUR SUPERVISORS

An-Son Drilling Company is considering responsible men for service in Colombia and Panama under the following conditions:

Short term contract, single status, previous South American experience, Spanish speaking, age to 45.

Please submit resume to:

Foreign Personnel
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Oklahoma City, Oklahoma

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OPERATING SUPERVISORS

For immediate employment. Job requires proof of U. S. citizenship, 3 to 5 years HCC or TCC experience at responsible level. No helpers or trainees desired. These are SUPERVISORY jobs ONLY and salaries are commensurate.

If interested and qualified, write:

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OIL REFINING COMPANY, INC.
P. O. Box 1406, Ponce, Puerto Rico

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GEOLOGICAL ENGINEER

with 4 to 6 years oil experience in industry since graduation. Must possess a B.S. or M.S. degree in Geological Engineering. Work background in subsurface mapping and well site geology mandatory. Experience in property evaluation and reserve estimates desirable. Excellent working conditions, employee benefits, and promotional possibilities. Send complete resume of educational background, work experience, and personal history to:

EMPLOYMENT OFFICE
P. O. BOX 2511, HOUSTON 1, TEXAS
(All replies will be held in confidence)

HELP WANTED

FOREIGN DOMESTIC Employment, Oil, Chemical, Industrial. No fee, send one to three complete resumes with confidence. W. T. Eldridge, Consultant, P. O. Box 6006, New Orleans 14, La.

DISTILLATION ENGINEER

Excellent opportunity for a Chemical Engineer with a new Petro-chemical Company located in the Ohio Valley, to be in charge of distillation units.

Four to five years experience desired. Salary open. Substantial employee benefits.

Contact:
NOVAMONT CORPORATION
P. O. Box 189
Kenova, West Virginia

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Johnston Testers, Inc., has openings in Dallas, Hobbs, Snyder, Houston, Oklahoma City, Wichita, New Orleans, Shreveport, Billings, Rock Springs, Los Angeles and Ventura for Sales Engineers. Graduate engineers with minimum of two year's oil field sales experience required. Previous experience in drilling, production and service work helpful. Age 25 to 30.

For personal interview, send complete resume listing experience, education and salary requirements to:

Personnel Director
JOHNSTON TESTERS, INC.
P. O. BOX 98 HOUSTON 1, TEXAS

RESERVOIR ENGINEER

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Background must include degree and 8-10 years Petroleum Engineering experience, the last 5 of which should have been in a specialized Reservoir Engineering function.

Liberal salary, biennial home furlough, family housing available.

Send complete resume to:

BOX 518-B
Radio City Station
New York 19, New York

PETROLEUM REFINERY PROCESS ENGINEER

B.S. or M.S. Chemical Engineer with three to five years experience in General Refinery Process Design, preferably with emphasis on TCC or HCC catalytic cracking, sulfuric acid alkylation, catalytic reforming, vapor recovery systems.

If interested, airmail your resume and salary requirements to:

M. D. Daeschner
Assistant Refinery Manager
COMMONWEALTH
OIL REFINING CO., INC.
P. O. Box 1406
Ponce, Puerto Rico

HELP WANTED

COMBINATION WIRE, line operation production Engineer for Mexico. Contact G. Prince, 26th Viena, Mexico City.

GRADUATE PETROLEUM RESERVOIR ENGINEER WANTED BY

Independent Exploration and Producing Company Operating in Rocky Mountain Area.

REQUIREMENTS: Age 25-35, Minimum three years Experience in Reservoir Engineering, Including Reserve Evaluations of Producing Oil and Gas Properties.

SALARY OPEN

Applicants submit Details of Education, Experience and Salary Desired to:
Box M-208, The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

SALES REPRESENTATIVE: age 32, 8 years experience in geophysical industry, last 3 years contacting for major geophysical contractor. Interested in sales representative job either domestic or foreign. Full resume on request. Box M-187, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY SUPERVISOR desires connection with progressive expanding organization. BSChE. Registered Professional Engineer. Box M-206, The Oil and Gas Journal, Tulsa, Oklahoma.

CAN YOU USE 24 years geophysical experience? South America, domestic any capacity up to and including executive levels, employee or consultant. Box M-188, The Oil and Gas Journal, Tulsa, Oklahoma.

MY EXPERIENCE can reduce your drilling costs on the Gulf Coast. Graduate Petroleum Engineer. Box M-191, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 18 years of experience covering all aspects of oil production, but particularly property appraisal and field operation. Desires position with active independent. Comprehensive background should be especially useful where small staff or one man is needed to evaluate deals, do engineering and supervise production. Box M-195, The Oil and Gas Journal, Tulsa, Oklahoma.

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of experience

Veteran production, drilling superintendent, uniquely experienced, all phases development; includes development of deals, acquisition of leases, purchasing, rotary & cable tool drilling, all types well completion, extensive secondary recovery experience, unexcelled performance record, impeccable reference. Capable complete management small company. Available Jan. 1, 1961. Box M-200, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL CONSIDER any reasonable offer in drilling, producing, management, sales. Petroleum Engineer with 15 years diversified experience with major. Box M-202, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 31, 7 plus, years strong gas experience, process control, evaluation, plant, field engineering, trouble shooting, product handling, testing, technical service eight plants. Desires challenging related work with future. Box M-201, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER—18 years diversified refinery experience desires change. Will consider work in process design, operations, or computers. Box M-203, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

Desire to acquire some oil and/or gas producing acreage; also substantial adjoining potential acreage for drilling.

BOX M-207
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

CAPITAL WANTED

DRILLING CONTRACTOR has 26 acres Eastern Kansas to drill with Bartlesville Sand production on three sides 690 ft. deep. Needs financial help to drill well on a cost basis. Reply: Box M-193, The Oil and Gas Journal, Tulsa Oklahoma.

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LEASE AND DRILLING BLOCKS

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THERMAL-AIR Secondary Oil Recovery Program. Shallow SE Kansas Oil Sands. Inquire: Box 119, McCune, Kans.

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CONSULTING SERVICE available in all phases of natural gas compression and treating. Specialized service in natural gasoline plant economics, design and operation. Box M-186, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 325.16 acres of land in two tracts within the known structure of the Dove Creek field, Montezuma County, Colorado will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2 p.m., M.S.T., February 15, 1961, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms for bidding, may be obtained from Dale R. Andrus, Land Office Manager, P. O. Box 1018, Denver 1, Colorado.

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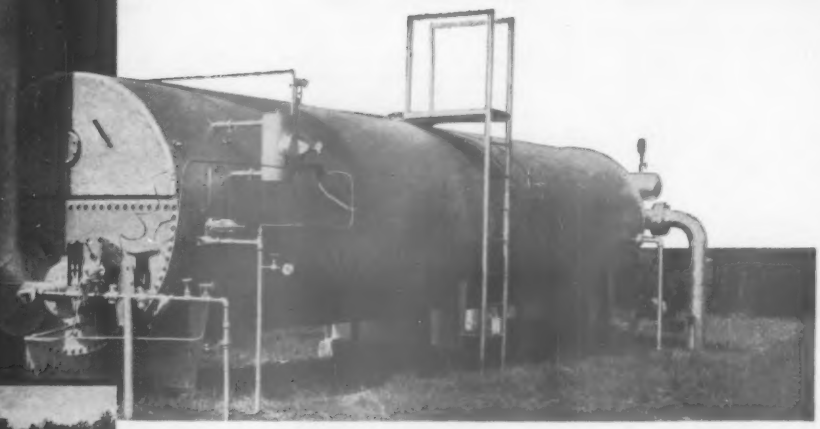

In an East Texas field during the winter months, it was necessary to man a pump station 24 hours a day. The station was pumping 2,760 BOPD with part of the crude bypassing through a relief valve to the pump suction. The high line pressure of 920 psi and automatic bypassing of the pump was caused by pumping cold viscous crude. Under these conditions, the station was handling only about 50% of the field allowable which was a 50% curtailment in production.

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Inlet pressure, heater	690 psi
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